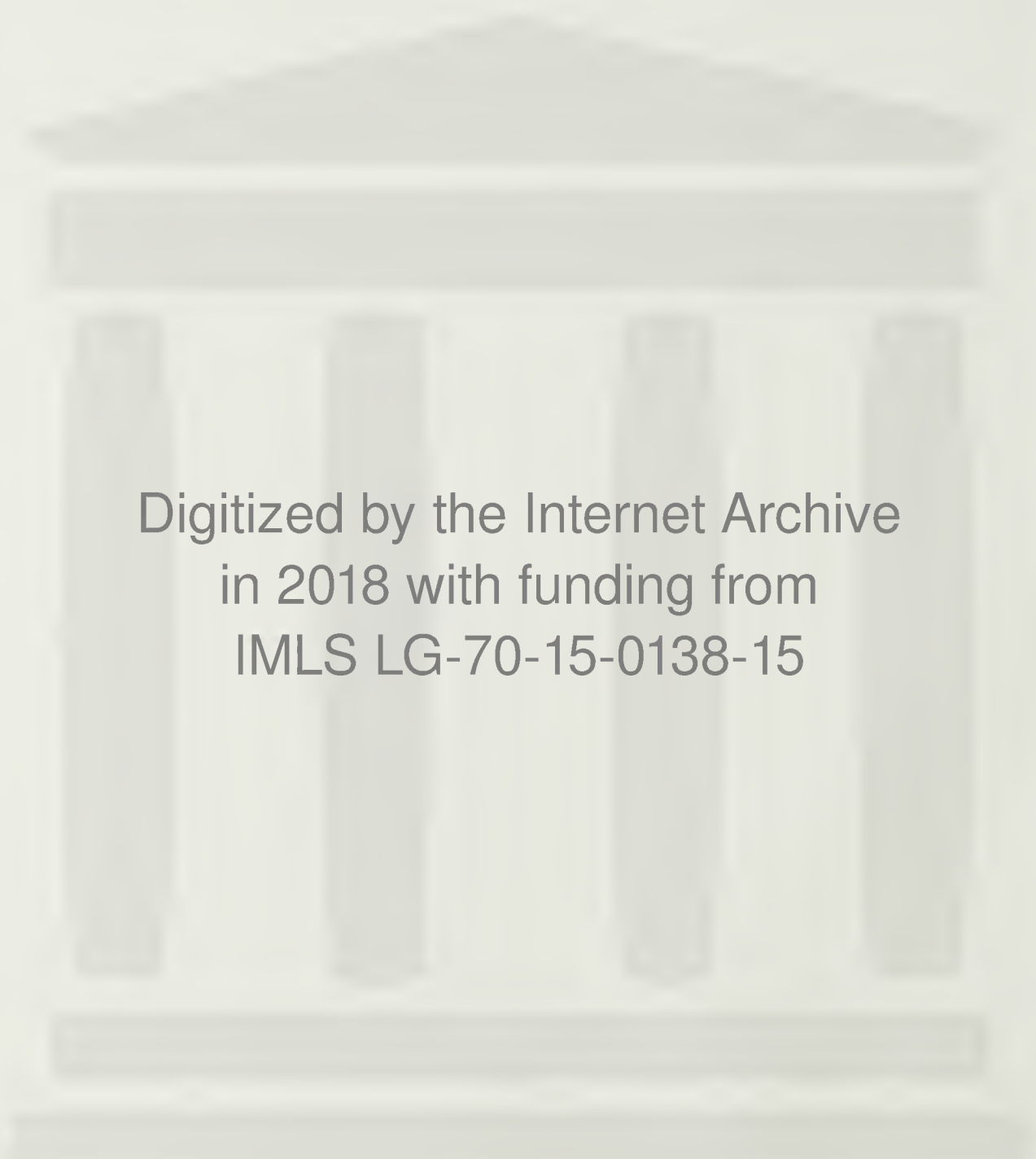


The American Museum of Natural History



1869
THE LIBRARY



Digitized by the Internet Archive
in 2018 with funding from
IMLS LG-70-15-0138-15

<https://archive.org/details/asbbulletin1416asso>



The ASB BULLETIN

Volume 14, Number 1

January 1967

LIBRARY
OF THE
AMERICAN MUSEUM
OF
NATURAL HISTORY



Adelie penguins (*Pygoscelis adeliae*) at Cape Bird, Ross Island, Antarctica

Harry L. Holloway, Jr.

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

MARGARET Y. MENZEL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

BETTY PEDDICORD, Assistant Editor
JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB
President — Elsie Quarterman, Vanderbilt University
Retiring President — Harry J. Bennett, Louisiana State University
President Elect — Harold J. Humm, Queens College
Vice-President — Wilbur H. Duncan, University of Georgia
Secretary — Margaret Y. Menzel, Florida State University
Treasurer — John Carpenter, University of Kentucky
Executive Committee — David James Cotter, Woman's College of Georgia; Chauncey G. Goodchild, Emory University; Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Robert B. Short, Florida State University; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS
Alabama — W. W. Miller, III, Samford University
Florida — John D. McCrone, Florida Presbyterian College
Georgia — Fred K. Parrish, Georgia State College
Kentucky — position vacant
Louisiana — Harry J. Bennett, Louisiana State University
Maryland — position vacant
Mississippi — Joseph Fitzpatrick, Mississippi State University
North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggins, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College
West Virginia — Earl L. Core, West Virginia University

AFFILIATE
Southern Section of the American Society of Plant Physiologists

CONTENTS

About the Columbia Meeting	3
International Symposium on Eutrophication Scheduled for June 11-16 in Madison, Wis.	7
Books and Periodicals	9
Regulations for Collecting in Mexico	10
News of Biology in the Southeast	11



About the Columbia Meeting

The Association of Southeastern Biologists will hold its 28th Annual Meeting April 20-22, 1967, at the University of South Carolina, Columbia, S. C. Registration and most activities will be in the Russell House on Green Street. The Thursday evening program will be held in Drayton Hall on Sumter Street beginning at 7:30 P.M. Following the program, exhibits will be on display and the smoker will be held at the Russell House. Friday will be occupied by paper sessions and the annual business meeting. A paper session sponsored by the Southeastern Section of the American Society of Ichthyologists and Herpetologists will also be held. The site of the Friday evening banquet, retiring President's address, and presentation of awards will be the banquet hall of Columbia Hall (the former Columbia Hotel) on Sumter and Gervais Streets.

Dates of meeting — April 20-22

Executive Committee Meeting — 1 P.M., Thursday, April 20, Russell House Conference Room.

Registration

Time — 4:00 P.M. to 7:15 P.M., Thursday
8:00 A.M. to 11:00 A.M., Friday

Place — Main lobby, Russell House

Fee — \$1.00

Location of Exhibits and Paper Sessions

Exhibits — Assembly room of Russell House
4-11 P.M., Thursday; 8 A.M.-11 P.M., Friday; 8 A.M.-noon Saturday.

Paper Sessions — Russell House and Life Science Building.

GENERAL INFORMATION

Columbia is the capital of South Carolina and the heart of a 250,000 size metropolitan area. The recent influx of many new industries in addition to those already long established here, along with the proximity of Fort Jackson, the Army's very active recruit-training center, gives the whole area an excellent base for economic progress and rapid growth.

Geographically, Columbia is in the center of the state and on the fall line between the Piedmont and Coastal Plain. Elevation ranges from about 200-250 feet. The very mild climate and rather adequate rainfall has allowed the development of a striking display of ornamentals, especially camellias and azaleas in the spring.

The Sand Hills, a 5-20 mile wide strip extending Northeast and southwest across the state, closely parallels the fall line and forms the most conspicuous physiographic feature of the central region. The strip represents what is generally believed to be a former beach line. Here the very porous sandy soil is poorly developed and supports a xeric type of vegetation with long-leaf pine and turkey oak being the most conspicuous species.

Local alcohol mores

Beer and wine are sold in grocery stores and in some restaurants. Hard liquors are available at retail liquor stores only.

Travel to Columbia

Highway routes serving Columbia are East-West I-26, U. S. 76, 378; North-South U. S. 1, 21, 321. The Seaboard and the Southern Railroads, the Greyhound and Carolina Trailways Bus Lines provide ground transportation to Columbia. Airlines serving Columbia Metropolitan Airport are: Delta, Eastern, Piedmont and Southern. Limousine fare one-way is \$1.25. If advised of your arrival time, a representative of USC can meet you at the airport. Correspondence concerning time of arrival by plane should be addressed to W. H. Queen, Biology Department.

The USC campus is located on the near south side of downtown Columbia, extending north and south from Green Street and eastward from Sumter Street.

Dining facilities

Dining facilities on the campus include the Faculty Dining Room at Russell House Union Building, serving during 11:30-1:30 lunch hour, and cafeterias located in Russell House, South Women's Residence Hall and M-N Men's Residence Hall which serve during regular meal time hours. These facilities are quite crowded from

11:30-12:30. A snack bar in Russell House remains open during the day and evening.

Other eating establishments within walking distance of the campus are: the Sportsman Restaurant on Assembly St. near Pendleton; the Market Restaurant on Assembly at Gervais; S and S Cafeteria on Gervais near Bull; Morrison's Cafeteria on Sumter at Washington; and Cornell Arms Cafeteria on Sumter at Pendleton. Several short order establishments are also located in the vicinity of the campus, and some downtown motels have restaurant facilities.

Placement Service

An attempt to formalize and improve the efficiency of the placement service will be made. The present plans are to have a registry of employers and potential employees. For those who wish, interview schedules will be arranged. The usual employment opportunity bulletin board service will also be available.

Field Trips

At present, pending expression of interest, the following field trips are planned:

1. For early arrivals on Thursday a field trip has been arranged by Dr. W. T. Batson to South Carolina sand hill communities in the vicinity of Columbia. Emphasis will be on floristic and ecological aspects of these communities.
2. On Saturday a tour planned by Dr. E. F. Thompson will include a visit to some Carolina Bays in Berkeley County, S. C. and the Grice Marine Laboratory in Charleston. The Bays to be visited have been studied floristically by Mr. Richard Porcher, a Ph.D. candidate at the University of South Carolina. Mr. Porcher will guide this portion of the trip. The Grice Marine Laboratory is operated by the College of Charleston and laboratory personnel will be present to guide a tour through the laboratory facilities.
3. A Saturday trip through swamp and flood plain communities in the vicinity of Columbia has been planned by Dr. W. T. Batson. Ecological and floristic aspects of the communities will be emphasized.

4. A tour of points of interest in Columbia will be conducted on Friday. Since this trip will be during the day, it is designed primarily for wives and children of the members who may find some idle time on their hands during paper sessions.

Local Arrangements Committee

Co-Chairmen	D. L. Claybrook G. T. Cowley
Housing and Family Activity	W. H. Queen
Banquet, Food Services	W. D. Dawson
Smoker, Exhibits, Publicity	J. M. Herr W. T. Wimer
Field Trips	W. T. Batson E. F. Thompson
Meeting Rooms, Audio-Visual	B. T. Cole
Transportation	W. H. Queen
Registration	Roberta Lovelace Cecile Huggins G. DeCoursey R. Lumb
Placement Service	R. Lumb
Finance	F. H. Lauter
Program	G. T. Cowley D. L. Claybrook

Accommodations

It is advisable to make reservations at least by the end of March. Write directly to the hotel or motel.

ROOM RATES OF METROPOLITAN COLUMBIA MOTELS-HOTELS

No. of Units	Type Room	Price
-----------------	--------------	-------

Facilities Within Walking Distance of USC Campus

DOWNTOWNER MOTOR INN

1301 Main Street	101	Single	\$ 8.50-\$12.00
		Double	\$ 8.50-\$12.00
		Twin	\$10.50-\$14.00

HEART OF COLUMBIA

1011 Assembly Street	100	Single	\$ 8.00-\$10.00
		Double	\$12.00-\$16.00
		Twin	—

ORVIN COURT

821 Assembly Street	101	Single	\$ 6.50-\$12.00
		Double	\$ 6.50-\$ 7.00
		Twin	\$ 7.00-\$10.00

TOWN HOUSE MOTOR INN

1615 Gervais Street	100	Single	\$ 8.00-\$12.00
		Double	\$12.00-\$18.00
		Twin	\$12.00-\$18.00

WADE HAMPTON HOTEL

350	Single	\$ 6.00-\$ 8.00
	Double	\$ 9.00-\$12.00
	Twin	\$12.50-\$14.50

Facilities in Downtown Columbia, Bus Service to USC Campus

CAPITAL CABANA MOTOR INN

1901 Assembly Street	122	Single	\$ 9.00-\$18.00
		Double	\$ 9.00-\$10.00
		Twin	\$12.00-\$16.00

GOLDEN EAGLE MOTOR INN

2025 Main Street	119	Single	\$ 8.00
		Double	\$11.00
		Twin	\$12.00

LAUREL HILL HIGHWAY HOTEL

1829 Assembly Street	50	Single	\$ 8.00-\$10.00
		Double	\$10.00-\$12.00
		Twin	\$12.00-\$14.00

Motels Within 5 Miles of USC Campus

HOLIDAY INN OF COLUMBIA

505 Knox Abbot Drive	158	Single	—
		Double	\$ 5.50-\$ 8.00
		Twin	\$ 8.00-\$13.00

HOLIDAY INN #2

Highway #1 and I 26		Single	\$ 8.50
		Double	\$14.00
		Twin	—

HOST OF AMERICA

4502 Devine Street	100	Single	\$ 9.00-\$16.00
		Double	\$ 9.00-\$10.00
		Twin	\$12.00

HOWARD JOHNSON'S MOTOR LODGE

Knox Abbott Drive, Cayce	70	Single	\$ 9.50-\$10.50
		Double	\$14.00
		Twin	\$16.00

HOWARD JOHNSON'S MOTOR LODGE, COLUMBIA NORTH

Highway I 26	66	Single	\$ 9.50
		Double	\$16.00
		Twin	—

QUALITY COURT MOTEL FOREST

3111 Two Notch Road	46	Single	\$ 9.00-\$13.00
		Double	\$13.00-\$15.00
		Twin	—

TREMONT MOTOR INN

Knox Abbott Drive	100	Single	\$ 9.00
		Double	\$11.00-\$13.00
		Twin	\$13.00-\$15.00

A number of other motels are located in the Columbia area.

CAMPING FACILITIES

The Sesqui-Centennial State Park is approximately 12 miles northeast of Columbia on U. S. 1. There are 36 campsites available, with utilities and hot showers. The fee is \$1.75 per day, and no sites are reserved in advance. For further details write to Park Supt., Sesqui-Centennial State Park, Columbia, S. C. 29206. Telephone Columbia (area 803) 787-6285.

Meritorious Award Nominations

As in previous years, an honorarium of \$100 has been made available by the Will Corporation of Georgia, to be used as an award for the recognition of especially meritorious teaching by a member of the ASB. The regulations governing the award are as follows:

The recipient must be a member of the ASB in good standing. He should have taught biology in a southern institution for at least ten years, and must be currently teaching. He must not be a dean or have regular administrative duties beyond the department level (this particular criterion requiring interpretation in individual cases). Among evidences of his qualifications is the progress of the candidate as indicated by recognition in his own institution (important assignments and other contributions specifically related to good teaching); and the number and quality of students for whom he provided primarily the inspiration to continue in biology, especially those who later received advanced degrees.

Past recipients of the Meritorious Award for Teaching are as follows:

- 1952. Dr. Mary Stuart MacDougall (Agnes Scott)
- 1953. Dr. Orland E. White (Univ. of Virginia)
- 1954. Dr. Woolford B. Baker (Emory)
- 1955. Dr. John N. Couch (Univ. of North Carolina)
- 1956. Dr. Hugo L. Blomquist (Duke)
- 1957. Dr. Ezda Deviney (Florida State)
- 1958. Dr. Henry R. Totten (Univ. of North Carolina)
- 1959. Dr. Margaret Hess (Winthrop College)
- 1960. Dr. Ora C. Bradbury (Wake Forest College)
- 1961. Dr. Warren Deacon (Vanderbilt)
- 1962. Dr. Septima C. Smith (Univ. of Alabama)
- 1963. Father Patrick H. Yancey (Spring Hill College)
- 1964. Dr. Ruskin S. Freer (Lynchburg College)
- 1965. Dr. Harwell P. Sturdivant (Western Maryland College)
- 1966. Dr. Charles Ray, Jr. (Emory Univ.)

In these times in which so much is heard about teaching, it is particularly important that excellence in teaching should be rewarded and publicized in every way possible. Members of the ASB are urged to make nominations and send the needed supporting material to *Dr. Julian Darlington, Chairman, Biology Dept., Southwestern at Memphis, Memphis, Tennessee* by 1 March 1967.

COMMITTEE

DOROTHY L. CRANDALL
H. BRANCH HOWE, JR.
JULIAN T. DARLINGTON, *Chairman*

Association Research Prize

The rules and regulations governing the annual Association Research Prize of \$100.00, sponsored by the Carolina Biological Supply Company, Elon College, North Carolina, are as follows:

1. The Research Prize is to be awarded for an especially meritorious paper actually presented at the annual meeting.

2. Only members are eligible to submit papers in competition for the Research Prize. This applies to all names on the submitted paper.

3. Papers submitted in competition may be in press but must not have been published prior to March 1 of the year of the current competition.

4. Papers submitted in competition are judged by eminent scientists in the various fields of biology. These individuals are selected by the Research Committee and are from schools outside the Southeast. Every effort is made by the Research Committee to keep the authors of submitted papers anonymous. Criteria for the award are left to the discretion of the judges' panel, who may withhold said award if no paper is considered to have sufficient merit.

5. Papers must be submitted *in triplicate* and in their entirety not later than March 1, 1967, to *Dr. Edward Clebsch, Dept. of Botany, Univ. of Tennessee, Knoxville, Tenn., 37916*. One copy of the prize-winning paper will remain in the ASB files, but all other copies will be returned to the authors as soon as possible.

6. Announcement of the winner of the Research Prize will be made at the annual meeting.

Ivey F. Lewis Fellowship at Mountain Lake Biological Station

A Research Fellowship of \$150.00 for summer course study or research at Mountain Lake Biological Station of the University of Virginia has been continued through the generosity of the Phipps and Bird Company of Richmond, Virginia. This fellowship, formerly known as the *Phipps and Bird Research Fellowship*, was re-named at the request of the Phipps and Bird Company. Any member of the Association may submit an application. The application should be accompanied by a summary of the planned work, by a list of important publications, and especially in the case of younger workers, by references and educational data. Applications should be sent to *Dr. J. J. Murray, Dept. of Biology, Univ. of Virginia, Charlottesville, Virginia 22903* not later than 29 March 1967. The selection will be made by the Research and Awards Committee of the ASB in consultation with the Director of the Mountain Lake Biological Station. The announcement of the recipient will be made at the annual meeting of the ASB.

COMMITTEE

J. J. MURRAY, *ex officio*
JAMES RIOPEL, *ex officio*
DONALD CAPIENOR
R. W. HULL
EDWARD E. C. CLEBSCH, *Chairman*

Mary Glide Goethe Travel Awards

For the tenth year there will be funds available through the generosity of the late Mr. C. M. Goethe for assistance to graduate students for expenses in connection with the annual ASB meetings, to be held this year at the University of South Carolina, Columbia, S. C. Approximately \$300 will be available from the contributions of Mr. Goethe, and it is anticipated that most of the awards will be for maintenance (lodging and meals), and departments are urged to provide travel allowances for their graduate students or to invite them to travel in cars with staff members. Some travel allowances may be awarded by the committee to those living most distant from Columbia.

Staff members are requested to call to the attention of qualified students in their respective institutions the availability of these awards. If there is more than one applicant from a department, the Goethe Committee may request the department to aid the committee's selection by ranking the applicants.

Any graduate student needing financial assistance in order to attend the 1967 meeting of the Association of Southeastern Biologists is eligible. Rules for making application for the Goethe Awards are as follows:

1. Indicate if application is being made for maintenance or travel or both. Give details, such as total sum requested, how many nights and days are involved, if travel allowance is requested, the number of miles involved and the proposed method of transportation, and any other pertinent information.

2. Give information as to whether or not a paper is being presented by the applicant.
3. In a paragraph, give a brief history of your education to date, of how many years you have been — and plan to be — in graduate school, of your major field or fields of interest, of any publications which have appeared or which may be in preparation, and any other pertinent professional details. Give information on marital status and number of children.
4. Give your source or sources of support while in graduate school such as G.I. Bill, N.S.F., N.I.H., teaching assistantship, etc.
5. Have your major professor or departmental head write a letter supporting your application.
6. Applications and supporting letters, both in triplicate, should be in the hands of *Dr. Thomas Daggy, Box 626, Davidson, N. C., 28036, by 1 March 1967*. Applicants will be notified of the decision of the Committee during March.

C. J. UMPHLETT, PAUL BAILEY,
THOMAS DAGGY, *Chairman*

A vote will be taken at the Business Meeting in April to determine whether or not the travel awards should be continued after the funds on hand are exhausted. So that members may be better informed on the history of the travel awards, we refer you to an article on the late Mr. Goethe that appeared in the *ASB Bulletin*, Volume 12, Number 3, July, 1965, pp. 66-67.

INTERNATIONAL SYMPOSIUM ON EUTROPHICATION SCHEDULED FOR JUNE 11-16 IN MADISON, WIS.

The complex processes, both natural and man-induced, which contribute to and, in the case of man's activities, frequently hasten the aging of lakes and streams will be the subject of an International Symposium on Eutrophication, to be held June 11-16, 1967 at the University of Wisconsin, in Madison.

The public symposium has been organized by the Division of Biology and Agriculture of the National Research Council in cooperation with the Atomic Energy Commission, Department of

Interior, National Science Foundation, and Office of Naval Research.

The program is intended to provide a review of the present status of world knowledge of the problem, as well as an open forum for the exchange of informed views on what may be done to slow or reverse the processes of eutrophication.

Taking part in the program will be 36 eminent scientists, from the United States and abroad, representing the fields of botany, chemistry, limnology, zoology, hydrology, and sanitary and agricultural engineering.

In addition, public policy considerations and the broad social and economic consequences of eutrophication will be discussed by Senator Gaylord Nelson, of Wisconsin, and Secretary of the Interior Stewart L. Udall. Senator Nelson will speak at noon on Tuesday, June 13, and Secretary Udall will address the banquet audience, Wednesday evening, June 14.

The symposium will be held in the Wisconsin Center Building of the University of Wisconsin and will be open to research scientists, public health personnel, conservationists, representatives of industry, officials from state and Federal regulatory agencies, and others interested in water pollution control. Proceedings of the symposium will be published and a copy sent to each registrant.

During the first full day session on Monday, June 12, reports will be presented documenting the eutrophication of lakes in Europe, Scandinavia, Asia, and North America. Special reports will be presented as well on the American Great Lakes, Canadian streams, and estuaries in Norway and the U. S.

The detection and measurement of eutrophication will be considered on Tuesday, June 13, in a series of papers dealing with the indices of eutrophication, primary productivity, zooplankton, fish, bottom organisms, phytoplankton, and bacteria.

On Wednesday, June 14, the symposium will take up the engineering problems of nutrient removal and the preventive measures needed to control urban, agricultural, and forest drainage. Corrective measures, including the removal of sediment and organic material, the use of chemical toxicants, and zoning restrictions will also be discussed.

Contributions to basic research from the study of eutrophication will be considered on Thursday, June 15. Papers will deal with the physiological stresses induced by eutrophication, nutrition of rooted aquatic plants and zooplankton, factors in plant growth, chemical exchange at the interface of sediment and water, past eutrophication from microfossils, geochemistry of eutrophication, and the use of mathematical models in eutrophication studies.

An executive session will be convened on Fri-

day, June 16, to prepare recommendations for appropriate remedial action by government and private interests.

A registration fee of \$10 has been set to cover the cost of the published proceedings of the symposium. Registration will begin at 2:00 p.m. Sunday, June 11, in the Wisconsin Center Building.

Gerard A. Rohlich, Professor of Civil Engineering, University of Wisconsin, is chairman of the planning committee for the symposium. Other members of the committee are: Alfred M. Beeton, Professor of Zoology, University of Wisconsin; David C. Chandler, Professor of Zoology, University of Michigan; W. T. Edmondson, Professor of Zoology, University of Washington; and Arthur D. Hasler, Professor of Limnology, University of Wisconsin.

Those desiring further information about the program may write to Dr. Michael R. DeCarlo, Division of Biology and Agriculture, National Research Council, 2101 Constitution Avenue, N.W., Washington, D. C. 20418.

The National Research Council is the operating agency of the National Academy of Sciences and the National Academy of Engineering, private organizations devoted to the furtherance of science and engineering and their use for human welfare. They also serve as official advisers to the Federal Government in science and technology.

Tentative Program

INTERNATIONAL SYMPOSIUM ON EUTROPHICATION

University of Wisconsin
June 11, 12, 13, 14, 15, 16, 1967
Wisconsin Center Building
Madison, Wisconsin

Sunday — June 11, 1967

14:00-17:00 Registration and Reception
20:00 Natural and Cultural Eutrophication
G. E. Hutchinson (USA)

Monday — June 12, 1967

CONCEPTS OF EUTROPHICATION & DOCUMENTATION — GEOGRAPHICAL

09:00 Opening Session — Welcome
F. H. Harrington, President
University of Wisconsin

- 09:15 The European Lakes (Southern)
Eugen A. Thomas (Switzerland)
- 10:00 Northern Europe & Scandinavia
Wilhelm Rodhe (Sweden)
- 10:45 Eastern Europe
M. Straskraba (Czechoslovakia)
- 11:30 Asian Lakes
S. Horie (Japan)
- 12:15 LUNCH
- 13:30 North America
W. T. Edmondson (USA)
- 14:15 Great Lakes
A. M. Beeton (USA)
- 15:00 Streams
H. L. Hynes (Canada)
- 15:45 (2 papers) Estuaries
K. Baalsrud (Norway)
B. Ketchum (USA)

Tuesday — June 13, 1967

DETECTION AND MEASUREMENT OF EUTROPHICATION

- 09:00 Indices of Eutrophication
Frank Hooper (USA)
- Biological
- 09:45 Primary Productivity
- 10:30 Zooplankton
J. Brooks (USA)
- 11:15 Fish
P. A. Larkin (Canada)
- 12:00 LUNCH
Speaker: The Honorable Gaylord Nelson
United States Senate
- 13:45 Bottom Organism
P. Jonasson (Denmark)
- 14:30 Phytoplankton
J. W. G. Lund (United Kingdom)
- 15:15 Bacteria
- Chemical
- 16:00 Chemical
W. Ohle (Germany)
- Physical
- 16:45 Physical
C. L. Mortimer (USA)
- 19:00 BOAT RIDE & PICNIC SUPPER

Wednesday — June 14, 1967

PREVENTIVE AND CORRECTIVE MEASURES

Preventive

- 09:00 Engineering Aspects of Nutrient Removal
G. A. Rohlich (USA)
- 09:45 Urban Drainage
- 10:30 Agricultural Drainage
R. Corey (USA)
- 11:15 Forest Drainage
Charles Cooper (USA)

12:00 LUNCH

Corrective

- 13:45 Chemical Toxicants
- 14:30 Sediment Removal
R. Ogelsby (USA)
- 15:15 Organic Production — Removal
D. Livermore (USA)
- 16:00 Legal Controls — Zoning
J. Beuscher (USA)
- 20:00 BANQUET
Speaker: The Honorable Stewart L. Udall
Secretary of the Interior

Thursday — June 15, 1967

CONTRIBUTIONS TO SCIENCE FROM THE STUDY OF EUTROPHICATION

- 09:00 Physiological Stresses Induced by Eutrophication
- 09:45 Nutrition of Rooted Aquatic Plants
G. Gerloff (USA)
- 10:30 Zooplankton Nutrition
G. Saunders (USA)
- 11:15 Plant Growth Factors
L. Pravosoli (USA)
- 12:00 LUNCH
- 13:30 Chemical Exchange at Sediment Water Interface
- 14:15 Past Eutrophication from microfossils
D. Frey (USA)
- 15:00 Geochemistry of Eutrophication
- 15:45 Interaction of Eutrophication Indices in Models
Fred Smith (USA)
- 16:30 Analytical Methods — Dissolved Substances
G. F. Lee (USA)

Friday — June 16, 1967

- 09:00 EXECUTIVE COMMITTEE MEETING AND
ADVISORY COMMITTEE TO PRESENT
RECOMMENDATIONS
- 11:30 ADJOURNMENT

Books and Periodicals

The 4th edition of A MANUAL OF TROPICAL MEDICINE by George W. Hunter, III, William W. Frye and J. Clyde Swartzwelder was released by W. B. Saunders Company on October 18. This is a book of some 931 pages and covers the diseases of the tropics, subtropics and many common to the temperate zone. Since it includes material from the viruses to the medically important arthropods, the authors secured the

collaboration of some 37 contributors to cover segments of the field they did not feel competent to write themselves.

The book is used extensively by the Armed Forces, Peace Corps personnel, medical students, public health workers and practicing physicians. Previous editions have been translated into Spanish and Polish with photo-offset copies being sold by the Japanese.

COMPREHENSIVE BIOCHEMISTRY, Vol. 14: Biological Oxidations. Ed. by M. Florkin and E. H. Stoltz. American Elsevier Publishing Company, Inc., N. Y. 514 pp. 1966. \$25.00.

This volume on Biological Oxidations is in Section III of the treatise on Comprehensive Biochemistry. Section III is devoted to topics of biochemical reaction mechanisms dealing mainly with the chemistry of enzyme systems and coenzymes. The present volume is concerned with oxidation reactions and mechanisms with emphasis on the enzyme complexes of the respiratory chain. The chapter topics covered include: Dehydrogenation; Chemistry and Function of Lipoic Acid; Flavoprotein Dehydrogenases of the Respiratory Chain; The Functional Complexes of the Mitochondrial Electron-Transfer System; Cytochromes and Cytochrome Oxidase; The Mitochondrial Electron-Transfer System; Oxidative Phosphorylation; Photosynthetic Phosphorylation; Enzymatic Activation of Oxygen; and Peroxidases and Catalase.

The chapters on Dehydrogenation, The Functional Complexes of the Mitochondrial Electron-Transfer System, and The Mitochondrial Electron-Transfer System are particularly informative, as they lucidly develop the concepts and clearly summarize the salient ideas of terminal oxidations. Although this is a relatively large volume and exceptionally well detailed, the information is adequately summarized. The chapter on The Mitochondrial Electron-Transfer System offers an excellent review and summary of the latest models for this system.

Another refreshing attribute of the papers in this volume is the historical development of the topics covered.

Considerable attention is paid to early investigations and this has been systematically integrated into the formulation of current models of oxidative mechanisms.

Aside from the general but thorough treatment of dehydrogenases, the specific enzyme complex receiving the most detailed treatment is that of succinic dehydrogenase. This is not unexpected since this is historically the best known oxidative complex.

Unlike other volumes examined in this series, the botanical aspects of biochemistry are given greater and their due consideration in this volume. The chapter on Photosynthetic Phosphorylation is particularly welcome, and constitutes an often neglected contrast to oxidative phosphorylation. The significant similarities and differences between these two types of phosphorylation are presented and illuminating.

My hopes expressed in an earlier review of another volume in this series (ASB Bulletin 13:76, 1966) appear to be realized in this volume—that of a truly biochemical exposé timely for physiologists. A casual reading of this volume prompts me to alter, to a more positive evaluation, my opinion of this series. This volume, and the others of Section III, will probably be of more immediate value to the physiologist than the more strictly chemically oriented volumes.

This volume appears to be relatively free of technical errors. It is superbly bound and printed on a heavy, textured paper—making a handsome book. However, the stated price is a deterrent to ownership for most interested investigators. RALPH D. AMEN, WAKE FOREST COLLEGE.

Regulations for Collecting in Mexico

The Department of State has asked the National Science Foundation to assist in informing the U. S. scientific community about regulations imposed by the Government of Mexico on all persons, including scientists, who wish to collect flora and fauna in Mexico for export.

The Government of Mexico is concerned about shipments of live wild animals and plants from Mexico. The tightening of regulations is part of a worldwide effort to protect scarce and endangered species. Strict enforcement of present regulations on plants, and new regulations on wildlife, have therefore been instituted by the Government of Mexico.

The following restrictions are now in effect:

1. No wild orchids or cactus may be sold or

exported and no one except authorized scientific collectors may collect any. Scientists who apply will be screened carefully and only those with a valid reason will be granted permits.

2. No wild birds, mammals, or terrestrial mammals may be sold or purchased, nor exported commercially.

3. Hunting for many species formerly on the open list is now prohibited or allowed only under special permit.

4. Scientific collectors of wild terrestrial animals must make formal application and pay a fee. Only those with legitimate research projects and sponsored by appropriate institutions will be issued permits.

5. Although there are no specific regulations

for collectors of marine life, both plant and animal, the same general procedure applies.

Scientists who are connected with appropriate institutions may apply for permits to take wild terrestrial plants from:

Ing. Alfonso Locra Borja,
Dirección General de Aprovechamientos Forestales,
Subsecretaría de Recursos Forestales y de la Fauna,
Águiles Serdán 28 — Segundo Piso,
Mexico, D. F.

To obtain a permit for the non-commercial export of the plant specimens that he collects, the botanist applies to:

Ing. Alfonso Tamez Mireles,
Dirección General de Economía Agrícola,
Subsecretaría de Agricultura,
Águiles Serdán 28 — Primer piso,
Mexico, D. F.

The accredited scientist who wishes to collect wild birds or terrestrial mammals and reptiles as part of his scientific studies, should send applications and fees to:

Dr. Rodolfo Hernández Corzo,
Director General de Caza,
Dirección General de la Fauna Silvestre,
Águiles Serdán No. 28 — 7mo. piso
Mexico, D. F.

The scientist who wishes to take fishes, amphibians, or aquatic mammals, reptiles and plants, should apply to:

Lic. Jorge Echaniz R.,
Director General,
Secretaría de Industria y Comercio,
Avenida Cuauhtémoc No. 80,
Mexico, D. F.

The American Embassy in Mexico City is able to help obtain permits, if given adequate advance notice, for scientists who are connected with U. S. Government agencies or institutions or who are conducting Federally sponsored research. The Embassy can help other qualified applicants on a "time available" basis.

PERMIT REQUIREMENTS

1. — Submit your application at your earliest convenience. It must be signed by the Director or Dean of the Scientific Institution where you work.
2. — State in detail the research program of your interest, and the intended use of specimens that you wish to collect.
3. — State the area in which you wish to work, and the number of specimens needed for your investigation.
4. — A \$20.00 U. S. currency fee is charged for the permit, and two small identification photographs are needed for your credential.
5. — Permits are issued only to senior research workers, not to students or assistants.
6. — Present yourself to the Delegado Forestal y de la Fauna in the State where your collection will take place, for the control of your permit and activities.
7. — Restrict yourself to the activities and number of specimens allowed in the permit, with due regard for the bio-ecological status of the area.

News of Biology in the Southeast

The University of South Alabama has acquired a tract of land on Big Creek Lake which will be developed into a permanent limnological research and teaching facility available to visiting scientists. Dr. Crawford G. Jackson, Jr. has been appointed Director of the Big Creek Lake Biological Station and will be responsible for development of the physical facilities and coordination of the teaching and research program.

Michael J. Pelczar, Jr., has succeeded Ronald Bamford as chief administrative officer of the Graduate School of the University of Maryland.

Norvel M. McClung, formerly of the University of Georgia, has been appointed Professor of Botany and Bacteriology at the University of South Florida, Tampa.

Marvin R. Alvarez, formerly of the University of Florida, has been appointed Assistant Professor of Botany and Bacteriology at the University of South Florida, Tampa.

Alan Richter has been appointed Assistant Professor of Microbiology at Georgia State College. He received his Ph.D. from the University of Wisconsin. He comes to G.S.C. from the Army Biological Laboratories, Frederick, Md.

Donald G. Ahearn will join the Microbiology staff at Georgia State College as Assistant Professor of Microbiology at the beginning of the winter quarter. He received his Ph.D. from the University of Miami.

Lamar Morrison (M.S., University of Georgia) started in September as Instructor of Microbiology at Georgia State College.

Other recent additions to the Biology Department of Georgia State College are Dr. Peter Gaffney, (Microbiology), from the Georgia Institute of Technology and Dr. Fred K. Parrish (Invertebrate Zoology) from Agnes Scott College. The department recently received a matching N.S.F. grant of \$17,400 for the purchase of instructional scientific equipment.

Applications for Environmental Health Fellowships are now being accepted for graduate study during the 1967-68 academic year at the Consolidated University of North Carolina (Chapel Hill and Raleigh campuses). This is a broad interdepartmental program designed to give students training for careers in research, teaching, and practice in environmental health. It is sponsored by the Departments of Biostatistics, Environmental Sciences and Engineering, and Epidemiology of the School of Public Health; the Departments of Botany, Chemistry, City and Regional Planning, Geology, and Zoology of the College of Arts and Sciences; the School of Medicine; and the Department of Food Science at North Carolina State University at Raleigh. Students will generally enroll in the department of their basic specialty and then select courses in other departments in order to obtain a broad understanding of the problems of the environment and the application of their specialty to the solution of these problems. The fellowships are provided through the Institute for Environmental Health Studies and include tuition, fees, and a stipend. The amount of the stipend under these fellowships will be in accordance with current Public Health Service and University policy.

Further information may be obtained by writing the head of any of the sponsoring departments. All are located at Chapel Hill, North Carolina except the Department of Food Science which is located at Raleigh, North Carolina.

The University of Tennessee

News from the Botany Department of The University of Tennessee includes a number of items. Mr. Wayne Chester, a graduate student, received support from the Society of the Sigma Xi for travel in connection with studies of the genus *Halesia* during the spring quarter. Dr. H. R. DeSelm also received support from Sigma Xi for travel to a workshop in Arizona at the Laboratory of Tree-Ring Analysis.

Dr. A. J. Sharp has traveled extensively during the past several months. He spent several weeks in Mexico in connection with his studies of bryophyte distribution in North America and Asia, in company with a Japanese botanist and graduate student. He also attended the Pacific Science Congress in Tokyo, Japan, in August, after delivering his address as immediate past president of the Botanical Society of America at the AIBS meetings. Dr. Larry Jones, who has just completed his first year in the department, worked as a research participant in the Biology Division of Oak Ridge National Laboratory during the summer. Dean Walter Herndon and Dr. Ray Holton received a contract with the U.S. Army for the study of certain aspects of the effect of environmental and physiological factors on algae reproduction. Dr. J. S. Olson, part-time professor in the department who is with ORNL and who is supported by funds from the Ford Foundation, is Project Director for a grant from the National

Science Foundation in an Advanced Science Seminar Project for the training of systems ecologists. Dr. Bernard G. Patten from ORNL is teaching the fall and winter quarters of this sequence.

Dr. Edward E. C. Clebsch was promoted to Associate Professor. He will administer a contract with the National Park Service in the amount of \$11,600 for the next two years to investigate factors related to the formation and maintenance of the grass and heath balds of the Great Smoky Mountains. He also administers a contract in the amount of \$12,500 with Union Carbide Corporation to continue services in connection with the cataloging, identification, collection, and processing of soil and vegetation samples from the Oak Ridge area. Dr. Clebsch also administers a contract with the Tennessee Game & Fish Commission for the study of grasses as potential wildlife plants in Tennessee. The graduate student on the last project, Mr. Ken E. Rogers, spent the summer at the U. S. National Herbarium in Washington under the support of The Association for Tropical Biology.

Dr. Sandra Bell is on leave for this year for the purpose of doing research in the Department of Genetics at the National Agriculture Institute in Paris, France. Dr. A. Murray Evans taught a course in pteridology at the Mountain Lake Biological Station in the first term this past summer. He continues to administer a 3-year NSF grant for \$26,000 for evolutionary studies in tropical ferns.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION		Publisher	File two copies of this form with your postmaster
(Act of October 3, 1917, Section 4109, Title 39, United States Code)			
1. DATE OF FILING 1 October 1966	2. TITLE OF PUBLICATION The ASB Bulletin		
3. FREQUENCY OF ISSUE Quarterly (January, April, July, and October)			
4. LOCATION OF KNOWN OFFICE OR PUBLICATION (Street, city, county, state, zip code) Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103			
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) Dept. of Zoology, Univ. of Kentucky, Lexington, Ky. 40506 (Dr. John Carpenter)			
6. NAMES AND ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR			
PUBLISHER (Name and address) Association of Southeastern Biologists, Inc., Chapel Hill, N.C.			
EDITOR (Name and address) C. W. Hart, Jr., Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa.			
MANAGING EDITOR (Name and address) none			
7. OWNER (If owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm its name and address, as well as that of each individual must be given.)			
NAME Association of Southeastern Biologists, Inc.		ADDRESS Chapel Hill, North Carolina (Dr. William J. Koch, Associate Professor, Dept. of Botany, University of North Carolina -- Agent.)	
8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If there are none so state)			
NAME none		ADDRESS	
9. Paragraphs 7 and 8 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company are trustees, hold stock and securities in a capacity other than that of a bona fide owner. Names and addresses of individuals who are stockholders of a corporation which itself is a stockholder or holder of bonds, mortgages or other securities of the publishing corporation have been included in paragraphs 7 and 8 when the interests of such individuals are equivalent to 1 percent or more of the total amount of the stock or securities of the publishing corporation.			
10. THIS ITEM MUST BE COMPLETED FOR ALL PUBLICATIONS EXCEPT THOSE WHICH DO NOT CARRY ADVERTISING OTHER THAN THE PUBLISHER'S OWN AND WHICH ARE NAMED IN SECTIONS 132.231, 132.232, AND 132.233, POSTAL MANUAL (Sections 4159a, 4159b, and 4110 of Title 39, United States Code)			
No advertising		AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	
A. TOTAL NO. COPIES PRINTED (Net Press Run)		SINGLE ISSUE NEAREST TO FILING DATE	
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES			
2. MAIL SUBSCRIPTIONS			
C. TOTAL PAID CIRCULATION			
D. FREE DISTRIBUTION (including samples) BY MAIL, CARRIER OR OTHER MEANS			
E. TOTAL DISTRIBUTION (Sum of C and D)			
F. OFFICE USE (LEFT-OVER UNACCOUNTED, SPOILED AFTER PRINTING)			
G. TOTAL (Sum of F, G, & 1—should equal net press run shown on 1)			
I certify that the statements made by me above are correct and complete		Signature of editor, publisher, business manager or owner C. W. Hart, Jr. Editor	

FD-350 (Rev. 1-65)

The ASB

BULLETIN

Volume 14, Number 2

April 1967

LIBRARY
OF THE
AMERICAN MUSEUM
OF
NATURAL HISTORY



Beetle

James Joern

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

MARGARET Y. MENZEL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

BETTY PEDDICORD, Assistant Editor
JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Elsie Quarterman, Vanderbilt University
Retiring President — Harry J. Bennett, Louisiana State University
President Elect — Harold J. Humm, Queens College
Vice-President — Wilbur H. Duncan, University of Georgia
Secretary — Margaret Y. Menzel, Florida State University
Treasurer — John Carpenter, University of Kentucky
Executive Committee — David James Cotter, Woman's College of Georgia; Chauncey G. Goodchild, Emory University; Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Robert B. Short, Florida State University; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — W. W. Miller, III, Samford University
Florida — John D. McCrone, Florida Presbyterian College
Georgia — Fred K. Parrish, Georgia State College
Kentucky — position vacant
Louisiana — Harry J. Bennett, Louisiana State University
Maryland — position vacant
Mississippi — Joseph Fitzpatrick, Mississippi State University
North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggin, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College
West Virginia — Earl L. Core, West Virginia University

AFFILIATE

Southern Section of the American Society of Plant Physiologists

CONTENTS

Association Affairs	14
Program of the 28th Annual Meeting of the Association of Southeastern Biologists	15
Abstracts of Papers Presented at the 28th Annual Meeting of the Association of Southeastern Biologists	22
Books and Periodicals	48
News of Biology in the Southeast	53

Note: Shortly before this issue went to press, we learned that Dr. Cain, who is scheduled to give the Invitational Address on April 20, will not be able to attend because of governmental commitments. Another speaker, recommended by Dr. Cain, will speak in his place — but at press time we do not know who this will be.

ASSOCIATION AFFAIRS

The Nominating Committee has selected the following slate of nominees for the various ASB offices that will be vacated this year. So that you may be able to consider your choices carefully, we are including a short biographical sketch of each nominee.

President Elect

John Mervin Herr, Jr. Robert B. Short

Vice-President

C. Ritchie Bell Margaret Y. Menzel

Secretary

Dorothy L. Crandall Faith S. Miller

Executive Committee

Burton J. Bogitsh Anna Josephine Bridgman
James C. McDonald Frances E. Silliman

(Continued on page 46)

Program of the 28th Annual Meeting of the Association of Southeastern Biologists

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southern Appalachian Botanical Club, the Southeastern Region of Beta Beta Beta National Honorary Biological Society, and the Southeastern Section of the American Society of Ichthyologists and Herpetologists.

THURSDAY, APRIL 20

- 12:00-2:00 P.M. Beta Beta Beta Registration: Room 200, Life Sciences.
 1:30 P.M. Executive Committee Meeting, Association of Southeastern Biologists: Conference Room, Russell House.
 2:00 P.M. Field Trip: Sandhills communities in the vicinity of Columbia. Led by Dr. W. T. Batson. Information available from Dr. Batson, Dept. of Biology, University of South Carolina.
 4:00-7:15 P.M. ASB Registration: Front Lobby, Russell House.
 and
 Conclusion of General Session until 10:00 P.M.
 6:00 P.M. Beta Beta Beta Smorgasbord: Room 119, Life Sciences.
 7:30 P.M. ASB General Session: Drayton Hall Auditorium. Dr. Elsie Quarterman, presiding.
 Address of Welcome: Dr. James A. Morris, Vice-President for Advanced Studies and Research, University of South Carolina.
 Response: Dr. Elsie Quarterman, President, the Association of Southeastern Biologists.
 Invitational Address: "Natural-area Preservation." Dr. Stanley A. Cain, Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior, and a plant ecologist.
 Smoker and Exhibits: A smoker with refreshments, will follow the general session and will be held in the Confederate Room of the Russell House. Exhibits will be on display in the Assembly Room, Russell House.
 Facilities in the Life Science Building and the Biology portion of the Science Annex: The Department of Biology will be open to visitors throughout the meetings. You are welcome in classrooms, teaching and research laboratories, the herbarium, and the greenhouse.

FRIDAY, APRIL 21

MORNING

- 7:15 A.M. Breakfast, Southern Appalachian Botanical Club: Palmetto Room, Russell House.
 7:15 A.M. Breakfast, Mountain Lake Biological Station Alumni and friends: Jasmine Room, Russell House.
 Both breakfasts. Go through cafeteria line in the Confederate Room for food and beverage. Silverware, etc. will be at your table.
 8:00-12:00 noon Registration: Front lobby, Russell House.
 8:00-10:00 A.M. Placement Service Registration: Front lobby, Russell House.
 8:30-12:00 noon Exhibits: Assembly Room, Russell House.
 8:30-11:30 A.M. Paper Sessions:
Systematic Botany and Floristics — Room 107, Life Science.
Animal Ecology, Genetics, and Vertebrate Zoology — Room 205, Russell House.
Plant Autecology and Physiology — Room 207, Russell House.
Cytology and Cytogenetics — Room 208, Russell House.
Vertebrate Physiology — Room 302, Russell House.

- 8:30-12:00 noon Southeastern Division of the American Society of Ichthyologists and Herpetologists — Paper session: Room 207, Life Science.
 8:30 A.M. Beta Beta Beta Registration: Ballroom, Columbia Hall.
 8:30-12:00 noon Beta Beta Beta Paper Sessions:
Eastern Division — Ballroom, Columbia Hall.
Western Division — Campus Room, Columbia Hall.
 11:45 A.M. Business Meeting, Association of Southeastern Biologists: Drayton Hall Auditorium.

AFTERNOON

- 1:00-5:30 P.M. Exhibits: Assembly Room, Russell House.
 1:00 P.M. Luncheon, University of North Carolina Botany Alumni and friends: Jasmine Room, Russell House.
 1:00-2:00 P.M. Beta Beta Beta General Meeting: Ballroom, Columbia Hall.
 2:00-5:30 P.M. Paper Sessions:
Plant Ecology — Room 107, Life Science.
Morphology and Morphogenesis — Room 207, Life Science.

Parasitology and Histology—Room 205, Russell House.
Invertebrate Physiology and Ecology—Room 207, Russell House.
Cryptogamic Botany—Room 302, Russell House.

2:00 P.M. Southeastern Division of the American Society of Ichthyologists and Herpetologists Business Meeting—Room 204, Russell House.

2:30 P.M. Tour: Scenic and Historic tour of Columbia, especially for families of ASB members. Please sign up during registration.

EVENING

7:00 P.M. Banquet: Ballroom, Columbia Hall.

ASB Evening Program: Ballroom, Columbia Hall.

Presentation of awards and prizes: Ivey F. Lewis Fellowship at Mountain Lake Biological Station. Sponsored by Phipps and Bird, Inc.

Association Research Prize. Sponsored by Carolina Biological Supply Company.

Meritorious Teaching Award. Sponsored by Will Scientific, Inc., Georgia.

Past Presidents Address: Dr. Harry J. Bennett, Louisiana State University—“Estuarine Biology.” (Including a 30 minute movie.)

SATURDAY, APRIL 22

8:00 A.M. Field Trips: Details at registration desk. Please sign up during registration.

1. Swamp and floodplain communities—Led by Dr. W. T. Batson. Vicinity of Columbia.
2. Carolina Bays and Grice Marine

8:30 A.M.

Laboratory—Led by Mr. Richard Porcher and Dr. E. F. Thompson.

Executive Committee Meeting, Association of Southeastern Biologists: Conference Room, Russell House.



SCHEDULE OF PAPER SESSIONS

FRIDAY MORNING — APRIL 21

SYSTEMATIC BOTANY AND FLORISTICS

Room 107, Life Sciences

Presiding: Dr. George S. Ramseur, The University of the South

- | | | | |
|------|--|-------|--|
| 8:30 | 1. EGGERS, DONNA MARIE (Vanderbilt University). Genetic Fruit Polymorphism in <i>Valerianella</i> (Tourn.) Mill. (Valerianaceae). | 10:01 | 8. DIETZ, ROBERT A. (Troy State College). The Epiphytic Orchids of Honduras, II. |
| 8:43 | 2. FREEMAN, JOHN D. (Vanderbilt University). <i>Trillium maculatum</i> Raf. and Related Taxa of Sessile-flowered <i>Trillium</i> . | 10:14 | 9. BROWNE, EDWARD T., JR. (University of Kentucky). Remarks Concerning the Endemics of Tygarts Creek Gorge, Carter Co., Kentucky. |
| 8:56 | 3. SHETLER, STANWYN G. AND JAMES F. MATTHEWS (Smithsonian Institution and Charlotte College). Generic Position of <i>Campanula americana</i> L. | 10:27 | 10. GREEAR, PHILIP F.-C. (Shorter College). Sag Pond Vegetation in Northwest Georgia. |
| 9:09 | 4. RAMSEY, GWYNN W. (Lynchburg College). A Biosystematic Study of the Genus <i>Cimicifuga</i> (Ranunculaceae), with Emphasis on <i>Cimicifuga rubifolia</i> Kearney. | 10:40 | 11. PULLEN, THOMAS M. (University of Mississippi). Progress Toward Production of a Flora of Mississippi. |
| 9:22 | 5. WARE, STEWART A. AND ELSIE QUARTERMAN (Vanderbilt University). A New <i>Talinum</i> (Portulacaceae) from the Cedar Glades. | 10:53 | 12. BLAIR, AARON AND JAMES W. HARDIN (North Carolina State University). Vascular Plant Flora of Beaufort County, North Carolina. |
| 9:35 | 6. BURK, C. JOHN (Smith College). A Correlation of Oak Hybridization and Glacial Geology on Cape Cod, Massachusetts. | 11:06 | 13. THACKER, WAYNE, WILLIAM F. RUSKA, AND GWYNN W. RAMSEY (Lynchburg College). A Preliminary Survey of the Flora of Several Southwestern Virginia Piedmont Counties. |
| 9:48 | 7. JONES, SAMUEL B., JR. (University of South- | | |

ANIMAL ECOLOGY, GENETICS, AND VERTEBRATE ZOOLOGY

Room 205, Russell House

Presiding: Dr. Frank B. Golley, University of Georgia

- | | | | |
|------|--|-------|--|
| 8:30 | 14. SMITH, MICHAEL H. (University of Georgia). Reliability of the Mark-release Technique of Estimating Numbers of Mice. | 9:22 | 18. SATTERFIELD, JAMES D. (Georgia State College). Reproduction in the Southern Studfish, <i>Fundulus stellifer</i> (Jordan). |
| 8:43 | 15. HEBERT, JOHN R., BOBBY F. DOWDEN, AND HARRY J. BENNETT (Louisiana State University and Mississippi State College for Women). Toxicity of Endrin to <i>Gambusia affinis</i> : A Comparison of Static and Flow-through Bioassay Systems. | 9:35 | 19. CARVER, J. E., JR. (University of Kentucky). Ecological-Genetic Aspects of South Amherst <i>Drosophila</i> Populations. |
| 8:56 | 16. HOSS, DONALD E. (Bureau of Commercial Fisheries, Radiobiological Laboratory, Beaufort, N. C.). Metabolic Rates of Estuarine Fish. | 9:48 | 20. WHITING, P. W. (Biology Division, Oak Ridge National Laboratory). A Diapause-resistant Stock of <i>Mormoniella</i> . |
| 9:09 | 17. DUKE, THOMAS W., JAMES N. WILLIS, AND DOUGLAS A. WOLFE (Bureau of Commercial Fisheries, Radiobiological Laboratory, Beaufort, N. C.). Studies on the Exchange of Trace Elements Between Estuarine Sediments and Water. | 10:01 | 21. SINGLETON, W. R. AND ENRIQUETA CARTER BOND (University of Virginia). A. Allele Necessary for Dilute Coat Color in Horses. |
| | | 10:14 | 22. WOOLCOTT, WILLIAM S. AND CAPERTON BEIRNE (University of Richmond). A Comparison of the Skulls of Young Flounders in Three Species of <i>Paralichthys</i> Girard. |
| | | 10:27 | 23. JONES, DUVAL A. (West Liberty State College). Green Tissues Among Neotropical Frogs. |

PLANT AUTECOLOGY AND PHYSIOLOGY

Room 207, Russell House

Presiding: Dr. Victor A. Greulach, University of North Carolina

- | | | | |
|------|---|-------|--|
| 8:30 | 24. BASKIN, JERRY AND ELSIE QUARTERMAN (Vanderbilt University). Ecological Studies of <i>Psoralea subacaulis</i> (Leguminosae). | 10:01 | 31. WHATLEY, BOOKER T., STANLEY O. THOMPSON, AND MCKINLEY MAYES (Southern University). The Effects of Soaking Treatments and Foliar Sprays on Rooting of <i>Sanchezia nobilis glaucophylla</i> . |
| 8:43 | 25. WARE, STEWART A. AND ELSIE QUARTERMAN (Vanderbilt University). Seed Germination in Two Species of <i>Tallinum</i> (Portulacaceae). | 10:14 | 32. VAN FLEET, D. S. (University of Georgia). Genetics and Differentiation of Polyacetylenes and Polyenes in Vascular Plants. |
| 8:56 | 26. BASKIN, JERRY, CAROL CAUDLE, AND ELSIE QUARTERMAN (Vanderbilt University). Germination and Dormancy in Two Cedar Glade Grasses. | 10:27 | 33. LUDLOW, C. JOSEPH AND FREDERICK T. WOLF (Vanderbilt University). Photosynthesis in Relation to Chlorophyll Content, Stomatal Distribution and Hill Reaction Activity in Shade and Sun Ferns. |
| 9:09 | 27. WITHERSPOON, J. P. (Radiation Ecology Section, Health Physics Division, Oak Ridge National Laboratory). Interactions of Fast Neutron Radiation and Growth-Dormancy Cycles in Yellow Poplar Trees. | 10:40 | 34. VEECH, JOSEPH A. (University of Georgia). Peroxidase Localization and Isozymic Alteration Resulting from Infection of Tobacco by <i>Phytophthora parasitica</i> var. <i>nicotianae</i> . |
| 9:22 | 28. TE-HSIU MA (Radiation Biology Laboratory, Smithsonian Institution). Red, Far-red Light Effect on Pollen Tube Elongation and Pollen Germination in <i>Tradescantia</i> . | 10:53 | 35. VAN FLEET, D. S. (University of Georgia). Localization and Rhythmic Enzymatic Development of Essential Oils in Flowers. |
| 9:35 | 29. FLINT, FRANKLIN F. (Randolph-Macon Woman's College). Histochemical Effects of Indole-3-Acetic Acid and Kinetin During Megagametogenesis in <i>Lilium</i> . | 11:06 | 36. WARREN, CHARLES O. (Southwestern at Memphis). Respiratory Metabolism in the Heterothallic Water Mold, <i>Achlya ambisexualis</i> Raper. |
| 9:48 | 30. CAPLENOR, DONALD AND DAO CONG NHU (Tennessee Technological University and | | |

CYTOLOGY AND CYTOGENETICS

Room 208, Russell House

Presiding: Dr. H. Branch Howe, Jr., University of Georgia

- | | | | |
|------|---|------|--|
| 8:30 | 37. STRICKLAND, P. L. AND J. W. DRANE (Emory University). Probability Values for Chromatid Aberrations. | 8:56 | 39. PEDIGO, ROBERT A. (The College of William and Mary). Effects of Dimethyl Sulfide and Naphthaleneacetic acid on Radiosensitivity of Cultured <i>Cucurbita</i> Calluses. |
| 8:43 | 38. BEATTY, ALVIN V. AND JEANNE W. BEATTY (Emory University). The Influence of Deoxy Compounds on Recovery from Radiation-induced Chromosomal Breaks. | 9:09 | 40. TAYLOR, F. G., JR. (Radiation Ecology Section, Health Physics Division, Oak Ridge National Laboratory). Nuclear Characteristics of <i>Populus deltoides</i> Clones. |

- 9:22 41. TOTTEN, R. E. AND H. BRANCH HOWE, JR. (University of Georgia). Nonrandom Nuclear Orientation in the Ascospores of *Neurospora tetrasperma*.
- 9:35 42. BATH, DANIEL W. (University of Mississippi). Radiation-induced Semisterility in the Mouse.
- 9:48 43. ST. AMAND, W. (University of Mississippi). Cell Population Dynamics in Irradiated Ehrlich Ascites Carcinoma.
- 10:01 44. COLE, MADISON B., JR., RALPH E. STEPHENS, AND J. GORDON CARLSON (University of Tennessee). Effects of Actinomycin-D on Nucleic Acid Synthesis in Grasshopper Neuroblasts.
- 10:14 45. PATTERSON, ROSALYN M. AND ERNEST L. HUNT (Emory University). Differential Reactivity of Urodele Developmental Chromosomes.

VERTEBRATE PHYSIOLOGY

Room 302, Russell House

Presiding: Dr. S. P. Maroney, Jr., University of Virginia

- 8:30 46. KENT, GEORGE C. (Louisiana State University). The Luteolytic Effect of Resectioned and Rejoined Pseudopregnant Hamster Uteri.
- 8:43 47. WIEAND, KATHERINE AND D. A. OLEWINE (Geisinger Medical Center and Bucknell University). Interference with Pregnancy in the Rat by an Intracervical Suture.
- 8:56 48. BENNETT, SARA N. AND D. A. OLEWINE (Georgia Southern College). Effect of Intrauterine and Intracervical Sutures on Deciduum Formation in the Rat.
- 9:09 49. WELCH, ANNEMARIE S. AND BRUCE L. WELCH (University of Tennessee). Neurochemical Response to Environmental Stimulation.
- 9:22 50. MILLER, JAMES A., JR., MICKEY VIA AND FAITH S. MILLER (Tulane University). Effects of THAM, Glucose, and Hypothermia Upon Tolerance to Asphyxia in Newborn Puppies.
- 9:35 51. THOMSON, J. RICHARD AND DAVID A. RINGLE (Midwest Research Institute, Kansas City, Mo.). Effect of L1210 Leukemia on C11/1431a Carbon Clearance in DBA/2 Mice.
- 9:48 52. IMHOFF, DIANE SUE AND RICHARD E. GARTH (Mississippi State College for Women). Possibility of Beryllium-Manganese Antagonism in Amputated Forelimbs of *Triturus viridescens*.
- 10:01 53. FRANKLIN, BERYL C. (Northeast Louisiana State College). Phenothiazine Derivatives and Biological Pregnancy Tests Using *Rana pipiens* and *R. clamitans* as Test Animals.
- 10:14 54. GARTH, R. E., J. R. FORTMAN, AND K. J. SMITH (Mississippi State College for Women and Northwestern State College of Louisiana). Separation of Mature and Immature Quail Hypothalamic Extracts by Gel Filtration.
- 10:27 55. SINE, JANE AND C. N. BOEHMS (Austin Peay State College and Vanderbilt University Medical School). A Method for Investigation of Aldosterone and Corticosterone in *Rana catesbeiana* Plasma.
- 10:40 56. FOREMAN, CHARLES W. (The University of the South). Comparative Aspects of *Peromyscus* Hemoglobin Ionographic Properties.
- 10:53 57. FATTIG, W. DONALD AND DAIL W. MULLINS (Southwestern at Memphis and Memphis State University). Molecular Hybridization of Human and Pigeon Hemoglobin.
- 11:06 58. BUSH, FRANCIS M. AND CHARLENE A. SEIBERT (Medical College of Virginia). Immunoelectrophoretic Analysis of Plasma Proteins of Posthatchling and Adult *Passer domesticus*.

SOUTHEASTERN DIVISION OF THE AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS

Room 207, Life Sciences

Presiding: Dr. Denzel E. Ferguson, Mississippi State University

- 8:30 59. BOSCHUNG, HERBERT (University of Alabama). The Status of the Genus *Branchiostoma* (order Amphioxii) in the Western North Atlantic.
- 8:45 60. RELYEA, KENNETH (Tulane University). Taxonomic Studies of Brackish Water *Fundulus* in the Southeast.
- 9:05 61. GOODYEAR, C. PHILLIP (Mississippi State University). Sun-compass Orientation in Mosquitofish, *Gambusia affinis*.
- 9:20 62. GILBERT, CARTER R. (Florida State Museum and University of Florida). Systematic Relationships of the American Cyprinid Fishes *Notropis ariommus* and *Notropis telescopus*.
- 9:35 63. LUDKE, J. LARRY AND W. DAVID BURKE (Mississippi State University). Endrin Uptake and Tolerances in Resistant and Susceptible Golden Shiners.
- 9:50 64. WOOLCOTT, WILLIAM S. AND CAPERTON BEIRNE (University of Richmond). A Comparison of the Skulls of Young Flounders in Three Species of *Paralichthys* Girard.
- 10:00 65. HOWELL, WILLIAM MIKE (Samford University). *Etheostoma davisoni* Hay, a Percid Fish Endemic to the Pensacola and Choctawhatchee Bay Drainages of Alabama and Florida.
- 10:15 10 minute recess.
- 10:25 66. CULLY, DUDLEY D., GEORGE G. MURPHY, AND MACK T. FINLEY (Mississippi State University). Some Characteristics of Pesticide-resistant Fishes.

- 10:40 67. WILLIAMS, JAMES D. (University of Alabama). A New Species of Sculpin (Pisces, Cottidae) from a Spring in the Alabama River Basin in Alabama.
- 10:55 68. WILLIAMS, JAMES D. AND WILLIAM M. HOWELL (University of Alabama). A New Cyprinid Fish of the Genus *Notropis* from the Tallapoosa River System in Alabama and Georgia.
- 11:10 69. BROOKS, G. R. (College of William and Mary). Influence of Environmental Factors on Color Change in *Anolis carolinensis*.
- 11:25 70. HARRISON, JULIAN R. (College of Charleston). Taxonomic Status of *Desmognathus aenus chermocki* Bishop and Valentine.
- 11:40 71. BRUCE, RICHARD C. (Western Carolina College). Climatic Factors in the Distribution of the Spring Salamander, *Gyrinophilus porphyriticus*, with Comments on its Zoogeographic History.
- 11:55 72. COOLEY, JAMES L. (University of Tennessee). A Study of an Isolated Population of the Salamander *Leurognathus*.

FRIDAY AFTERNOON — APRIL 21

PLANT ECOLOGY

Room 107, Life Sciences

Presiding: Dr. Joe A. Edmiston, University of Georgia

- 2:00 73. EDMISTEN, JOE A., AND HENRY F. PERKINS (University of Georgia). The Role and Status of Kudzu in the Southeast.
- 2:13 74. HOOKS, W. S. (Lynchburg College). The Ecological Status of *Pinus strobus* L. in Ogle County, Illinois.
- 2:26 75. MCCORMICK, J. FRANK, LEOLA CROSTHWAITE, CAROL DAMON, WESLEY EGAN, JOHN FINDLEY, VIOLET A. HICKS, RICHARD LEONARD, AND WILBUR H. RITTENHOUSE (University of North Carolina, Chapel Hill). Niche Differentiation Between Two Closely Related Species.
- 2:39 76. MILLER, GARY L. (University of North Carolina, Chapel Hill). The Effects of Ionizing Radiation on the Growth of Old-Field Species.
- 2:52 77. GARRETT, ARTHUR (Emory University). Quantitative Considerations of Ecosystem Disturbance by Gamma Irradiation.
- 3:05 78. BALLAL, S. K. (Tennessee Technological University). A Preliminary Study on the Effect of Fire on Three Plant Communities.
- 3:18 79. SENECA, ERNEST D. (North Carolina State University). Seedling Response of Four Dune Grasses to Varying Levels of NaCl.
- 3:31 80. COOPER, ARTHUR W. AND JAMES W. HARDIN (North Carolina State University). Habitat Factors Associated with Mountain Disjuncts in the Eastern Piedmont of North Carolina.
- 3:44 81. DAHLMAN, ROGER C. AND CLAIR L. KUCERA (University of Missouri). Preparation of ¹⁴C Labeled Grass for Use in Evaluating Organic Turnover in a Prairie Ecosystem.
- 3:57 82. ROGERS, HOLLIS J. AND JOHN D. BARNETT (University of North Carolina, Greensboro, and Hanging Rock State Park). Distribution of *Tsuga canadensis* (L.) Carr. and *T. caroliniana* Engelm. Along Cascades Creek in the Vicinity of Hanging Rock State Park, Danbury, North Carolina.
- 4:10 83. HARTSHORN, GARY S. (North Carolina State University). Forest Vegetation Patterns in Southern Beaufort County, North Carolina.
- 4:23 84. BARCLAY, FRANK H. AND JOE A. CHAPMAN (East Tennessee State University and Carson-Newman College). Alison's Woods.
- 4:36 85. PIEHL, MARTIN A. (University of Wisconsin-Milwaukee). Parasitism and Host Range of *Nestronia umbellula* Raf. (Santalaceae).
- 4:49 86. PIEHL, MARTIN A. (University of Wisconsin-Milwaukee). Root Grafts and Haustorial Self-parasitism in *Aureolaria* (Scrophulariaceae).
- 5:02 87. PATTON, E. GIBBES (Wofford College). Plant Ecology in the Education of Pre-Medical Biology Undergraduates.
- 5:15 88. SIMMONS, GEORGE M., JR. (Virginia Polytechnic Institute). Limnetic Carbon Assimilation in Two Virginia Reservoirs.

MORPHOLOGY AND MORPHOGENESIS

Room 207, Life Sciences

Presiding: Dr. John D. Reynolds, University of Southern Mississippi

- 2:00 89. REMBERT, DAVID H., JR. (University of Kentucky). Comparative Megasporogenesis in Leguminosae, Subfamily Caesalpinoideae.
- 2:13 90. COFFEY, JANICE C. AND J. M. HERR, JR. (Clemson University at Sumter and University of South Carolina). The Development of the Ovule and Megagametophyte in *Luzula bulbosa* (Wood) Rydb.
- 2:26 91. TANDON, S. R. AND J. M. HERR, JR. (University of South Carolina). Some Embryological Features of Taxonomic Significance in the Genus *Nyssa* L.
- 2:39 92. HERR, J. M., JR. (University of South Carolina). An Innovation in the Paraffin Embedding Technique for the Preparation of Excised Angiosperm Ovules.
- 2:52 93. LUCANSKY, T. W. AND J. M. HERR, JR. (University of South Carolina). A Preliminary Report on Floral Induction in Seedlings of *Chenopodium album* L.
- 3:05 94. O'DELL, HERMAN (East Tennessee State University). A Wild Yam.
- 3:18 95. SALTERS, ARMSTEAD L. AND LAFAYETTE FREDERICK (Atlanta University). Histo-

- logical Changes Induced in Nodal Traces and Petioles of *Ulmus americana* by Culture Filtrates of *Ceratocystis ulmi*.
- 3:31 96. FLEMING, LAURENCE E. (Mississippi State University). Use of the Appendix Masculina as a Taxonomic Character in the Shrimp *Palaemonetes*.
- 3:44 97. REAMS, W. M., JR., R. B. SCOGGINS, AND A. S. ZELICKSON (Medical College of Virginia, University of Richmond, and University of Minnesota Medical School). An Experimental and EM Analysis of the Origin of Langerhans Cells.
- 3:57 98. HUNT, ERNEST L. (Emory University). Staining Techniques for the Endocrine Pancreas.
- 4:10 99. GARRISON, NORMAN E. AND J. E. DAVIS, JR. (Wake Forest College). Effects of Ethanol on Morphogenesis and Distribution of Glycogen in Developing *Rana pipiens*.
- 4:23 100. McLAUGHLIN, ELLEN W. (Emory University). The Fertilizability of Eggs of *Triturus viridescens* Taken from Different Levels of the Oviduct.

PARASITOLOGY AND HISTOLOGY

Room 205, Russell House

Presiding: Dr. Grover C. Miller, North Carolina State University

- 2:00 101. HENDRICKS, LARRY (North Carolina State University). A New *Hystrix* from the Common Crow. (Nematoda: Dioctophymidae).
- 2:13 102. POWDERS, VERNON N. (University of Tennessee). A New Host Record for *Cepedietta* (= *Haptophrya*) *michiganensis* (Woodhead), 1928.
- 2:26 103. PRICE, CHARLES E. AND PETER S. MAITLAND (North Texas State University and the University, Glasgow, Scotland). The Proposed Role of Parasites as Indicators of Host Ancestry.
- 2:39 104. HARRIS, ALVA H., R. HARKEMA AND G. C. MILLER (North Carolina State University). Life Cycle of *Procyotrema marsupiformis* Harkema and Miller, 1959. (Trematoda: Alariinae).
- 2:52 105. MILLER, GROVER C. AND REINHARD HARKEMA (North Carolina State University). Helminths from Some Wild Mammals in the Southeastern United States.
- 3:05 106. POWDERS, VERNON M. (University of Tennessee). Altitudinal Distribution of *Cepedietta* (= *Haptophrya*) *michiganensis* (Woodhead), 1928.
- 3:18 107. ROGERS, STEFFEN AND BURTON J. BOGITSH (Vanderbilt University). Nucleoside Polyphosphatase Activity in Helminths.
- 3:31 108. SHANNON, W. ALLEN (Vanderbilt University). Autoradiographic and Histochemical Studies of Iron Metabolism in *Haematoloechus medioplexus*.
- 3:44 109. DAVIS, DONALD A., B. J. BOGITSH, AND D. A. NUNNALLY (Vanderbilt University). Ultrastructure of the Caecum of *Haematoloechus medioplexus*.
- 3:57 110. NORRIS, WILLIAM W. (Northeast Louisiana State College). Specificity of Action of Proteolytic Enzymes (Histological Evaluation).*
- 4:10 111. DELANEY, JOSEPHINE AND ROY HUNTER, JR. (Atlanta University). Some Effects of Specific and Nonspecific Proteolytic Enzymes on the Notochordal Sheath of Bullfrog Larvae.

* The abstract of this paper is not in alphabetical order. It can be found on page 28.

INVERTEBRATE ECOLOGY AND PHYSIOLOGY

Room 207, Russell House

Presiding: Dr. Richard G. Wiegert, University of Georgia

- 2:00 112. STYRON, CLARENCE E. (Emory University). Ecology of Two Populations of an Aquatic Isopod, *Lirceus fontinalis* Raf.
- 2:13 113. GRAY, I. E. (Duke University). The Distribution of Seastars of the North Carolina Continental Shelf.
- 2:26 114. BERRY, JAMES W. (Duke University and the Institute of Marine Science, Miami). Distributional Ecology of the Spiders of the North Carolina Piedmont Old-Field Succession.
- 2:39 115. MOZLEY, SAMUEL C. (Emory University). Multiple Regression Comparisons of Six Abiotic Parameters with the Distribution of Two Species of *Chironomus* (Diptera, Chironomidae) in a Five Hectare Piedmont Lake.
- 2:52 116. BAMFORTH, STUART S. (Tulane University). Heterotrophic Protozoa as Ecological Indicators.
- 3:05 117. GENTRY, JOHN B. (University of Georgia). The Effect of Artificial Predation on the Behavior and Population Densities of *Pogonomyrmex badius* Colonies.
- 3:18 118. BISHOP, JOHN W. (University of Richmond). Feeding by Ctenophores and its Effect on Zooplankton.
- 3:31 119. JINKS, WILLARD (Indiana Central College). The Reproductive Potential of *D. affinis*.
- 3:44 120. LUTZ, PAUL E. (University of North Carolina at Greensboro). Studies on the Life-History of the Damselfly *Lestes eurinus*.
- 3:57 121. BROWN, PAT I. AND JOHN M. CARPENTER (University of Kentucky). Retention of Zinc-65 in Population of *Drosophila melanogaster*.

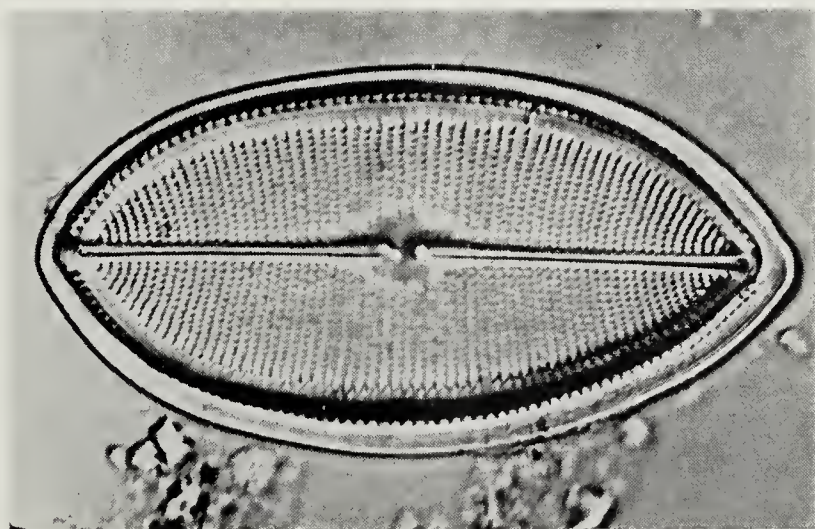
- 4:10 122. WILSON, BILLY G. AND J. J. FRIAUF (Vanderbilt University). Facultative Diapause in *Trogoderma sternale maderae* Beal, 1954.
- 4:23 123. MOBBERLY, W. C., JR. (Northeast Louisiana State College). Endocrine Control of Locomotor Activity in the Crawfish *Faxonella clypeata*.
- 4:36 124. GITTLESON, STEPHEN M. (University of Kentucky). Forces Produced by Beating Flagella of *Polytomella agilis*.
- 4:49 125. TIETJEN, WILLIAM L. AND JAMES N. LILES (Georgia Southwestern College and University of Tennessee). C-14 Isoleucine Studies in *Aedes aegypti*.
- 5:02 126. STIDHAM, JAMES D. AND JAMES N. LILES (University of Tennessee). The Free Amino Acid Composition and Certain Aspects of the Metabolic Fate of Carbon-14 Labeled Alpha Alanine and Aspartic Acid in the Aging Female Mosquito, *Aedes aegypti* (L.).
- 5:15 127. MCCRONE, JOHN D. AND ROBERT J. HATALA (University of Florida and Florida Presbyterian College). Serological Identity of the Mammalian Lethal Components of the Venoms of *Latrodectus mactans* and *L. variolus*.

CRYPTOGAMIC BOTANY

Room 302, Russell House

Presiding: Dr. William J. Koch, University of North Carolina

- 2:00 128. OLEXIA, PAUL D. (University of Tennessee). The Genus *Clavaria* in the Southeastern U. S.
- 2:13 129. PETERSEN, RONALD H. (University of Tennessee). The Genus *Clavulina* (Fungi, Clavariaceae) in the Southeastern United States.
- 2:26 130. UMPHLETT, CLYDE J. (University of North Carolina, Chapel Hill). An Ecological Study of a Fungus Parasite in Mosquito Larvae.
- 2:39 131. BENSON, GEORGE L. AND G. T. COWLEY (University of South Carolina). Distribution of Soil Microfungi in a South Carolina Sandhill.
- 2:52 132. COWLEY, G. T. (University of South Carolina). Vertical Distribution of Microfungi on Two Trees in the Luquillo Experimental Forest, Puerto Rico.
- 3:05 133. MULLINS, J. T. AND D. DES S. THOMAS (University of Florida). Biochemical Mechanisms in the Hormonal Control of Sexual Morphogenesis in *Achlya*.
- 3:18 134. PLUMMER, G. L. (University of Georgia). Accumulation of Radioisotopes in Certain Lichens.
- 3:31 135. WALKER, ALMA TOEVS (University of Georgia). Ultrastructure of the Fungus-Alga Association in *Cornicularia normoerica*.
- 3:44 136. YOSHIMURA, I. AND A. J. SHARP (University of Tennessee). Interesting Record of Southern Appalachian and Mexican Lichens.
- 3:57 137. SHARPLEY, J. MILES (Sharpley Laboratories, Inc.). Growth and Survival of Water Microorganisms in Low Nutrient Media.
- 4:10 138. WHITFORD, L. A. (North Carolina State University). Notes on *Tetrasporopsis funescens*, a Fresh-water Alga of Apparently Wide Distribution.
- 4:23 139. EARLE, SYLVIA A. (Cape Haze Marine Laboratory and Farlow Herbarium, Harvard University). Deep Water Algae in the Gulf of Mexico.
- 4:36 140. GRIFFIN, DANA G., III (University of Tennessee). A Further Look at the Biosystematics of *Chara zeylanica*.
- 4:49 141. CARROLL, JACK W. AND T. R. DEASON (University of Alabama). Chromosome Numbers in the Genus *Draparnaldia*.
- 5:02 142. GRIFFIN, DANA G., III (University of Tennessee). A Botanical Case of Mayr's Founder Principle from the Charophyta.



Abstracts of Papers Presented at the 28th Annual Meeting of the Association of Southeastern Biologists

The number in parenthesis at the top of each abstract refers to the number of that paper in the program.

(78)

A Preliminary Study on the Effect of Fire on Three Plant Communities

S. K. BALLAL, *Tennessee Technological University*

One grassland and two loblolly pine communities were selected to study the extent of rejuvenation after continual and discontinual fires. The results indicated that in open communities like grassland, accidental spread of any saplings is restricted by fire, and also that the annual fires tipped the vegetation equilibrium toward grasses and herbs. In one of the pine communities, accidental fire destroyed all the ground vegetation with very little damage to the pine stand, in which eight months after the incidence of fire the grass has been replaced by Golden Aster, Field Aster and Greenbrier. In the other pine community, two years after the fire, grass has been replaced by Honeysuckle. The Loblolly pines were found to be fairly resistant to fire damage.

(116)

Heterotrophic Protozoa as Ecological Indicators

STUART S. BAMFORTH, *Newcomb College of Tulane University*

Specializations of morphology, nutritional habits, and adaptations to abiotic conditions enable many heterotrophic protozoa to serve as indicators of ecological conditions. Despite Hynes' observation that specialized knowledge is required for detailed species identifications, the principal types and common species may easily be determined. Ciliates of a particular morphology are present in a habitat usually only at a particular stage in the evolution of the habitat, hence their presence indicates the degree of decomposition of organic material. The kinds of ciliates and testacea found in a soil reflect the degree of dessication and comparative decay rate of organic matter.

(84)

Alison's Woods

FRANK H. BARCLAY, *East Tennessee State University*
JOE A. CHAPMAN, *Carson-Newman College*

At the Raleigh meeting of the ASB in 1966, Alison's Woods in Sullivan County, Tennessee, was described in a paper by Frank H. Barclay. The immediate need for study of this nearly natural area was emphasized. A study of Alison's Woods was begun in September, 1966, by Barclay and Chapman, and a progress report was made at the Johnson City meeting of the Tennessee Academy of Science in November, 1967. The present paper summarizes the results of plotless sampling of the vegetation in thirty areas of a 250 acre woodland in Upper East Tennessee. Sampling was completed a short time before cutting operations were begun. The principal dominant tree species were White Oak, Tulip Poplar, Black Oak, and Northern Red Oak. Chestnut

Oak was locally dominant on a ridge and steep slopes. All of these species were represented by trees of unusually large size. Cutting is scheduled for completion by March or April, 1967. A number of diameter, height and age determinations have been made. Tree-ring studies are being made by Lanier Brashear, a graduate student at East Tennessee State University.

(26)

Germination and Dormancy in Two Cedar Glade Grasses

JERRY BASKIN, CAROL CAUDLE, AND ELSIE QUARTERMAN, *Vanderbilt University*

Aristida longispica Poir. and *Sporobolus vaginiflorus* (Torr.) Wood are summer dominants of the grassy cedar glades of Middle Tennessee. The seeds of these annual grasses germinate in the spring after they have overwintered in the field. The plants flower in late summer and mature fruits are shed in late fall and early winter. Upon maturity practically 100% of the seeds of both species are dormant. Gibberellic acid, potassium nitrate, and thiourea had no effect on germination of fresh seeds. Intact seeds imbibed water readily and embryos grew normally when the endosperm was removed. Dormancy in seeds of *Aristida* was overcome by stratification for 8-10 weeks and in *Sporobolus* by afterripening for 3-4 months either in warm, dry or cold, moist storage. Non-dormant seeds of *Aristida* require a higher temperature for germination than seeds of *Sporobolus*. The length of the dormant period and the temperature requirement for germination in these two grasses are discussed in relation to their germination in nature.

(24)

Ecological Studies of *Psoralea subacaulis* (Leguminosae)

JERRY BASKIN AND ELSIE QUARTERMAN, *Vanderbilt University*

Psoralea subacaulis T. & G. is a low, spreading geophyte restricted to the shallow, rocky soils of the cedar glades of Middle Tennessee, northern Alabama, and northern Georgia. Field and laboratory studies were conducted on the ecological life history of *P. subacaulis* to determine how adaptation to this specialized habitat is exhibited by this species. Identification of the factor(s) restricting it to open glades was a second objective. *P. subacaulis* is well adapted to open cedar glades because: (1) its roots penetrate interstices among rock fragments and utilize the meager soil accumulated there, and (2) it completes the most active part of its life cycle during the cool, moist winter and early spring and is dormant during the hot, dry summer. *P. subacaulis* was found to be obligate upon a high light intensity; therefore, it cannot tolerate competition. This factor alone seems adequate to explain its restriction to open glades where larger plants find establishment difficult.

(42)

Radiation-Induced Semisterility in the Mouse

DANIEL W. BATH, *University of Mississippi*

Male mice that were mutant for markers in six different linkage groups were irradiated (640r or 700r of X-rays) and from their progeny thirty-eight semisterile lines have been established. Twenty-two were derived from eighty-eight tested females, sixteen from eighty-six tested males. Relative fertilities range from 22.2 to 55.5 percent of normal.

In two lines it has been established cytologically that semisterility is the result of reciprocal translocations. In one of these, two genetically marked chromosomes (Linkage groups I and XIV) are apparently involved. Cytogenetic correlation has not as yet been reported for Linkage group XIV.

(38)

The Influence of Deoxy Compounds on Recovery From Radiation-Induced Chromosomal Breaks

ALVIN V. BEATTY AND JEANNE W. BEATTY,
Emory University

Inflorescences of *Tradescantia paludosa* were irradiated with a total dose of 400 r of X-rays, and the radiation damage was determined from investigating the metaphase configurations of the first microspore division. The experimental material was treated with various chemicals to determine their effect on the recovery process. Deoxyadenosine, Deoxy Guanosine, Deoxycytidine, Deoxyuridine, and Thymidine were used. All brought about a 50% reduction in chromosomal aberrations over the control, except Thymidine. This chemical had very little effect. When these substances were used in pairs, no greater recovery was found. When all five were used simultaneously, the greatest recovery was found. When these five were used with ATP or Pyrophosphate, or with both, no greater reduction was found.

(48)

Effect of Intrauterine and Intracervical Sutures on Deciduomata Formation in the Rat

SARA N. BENNETT AND D. A. OLEWINE,
Georgia Southern College

Several investigators have reported an inhibition of deciduomata formation resulting from the presence of an intrauterine suture. In the present study sutures (Ethcon 2-0) were placed along the entire length of either one uteri or one cervix of sexually mature rats. The entire length of the lumen of all uterine horns was scratched with a hypodermic needle (#22) on day 4 of pseudopregnancy. The animals were sacrificed on day 8 of pseudopregnancy and wet and dry weights obtained for each uterine horn. Although the intrauterine sutures markedly inhibited deciduomata formation, the intracervical sutures had very little effect. In another group of animals intrauterine sutures were placed either in the upper $\frac{1}{4}$ or the lower $\frac{1}{4}$ of the uterine lumen. In these animals deciduomata formation was greatly modified but not totally suppressed.

(131)

Distribution of Soil Microfungi in a South Carolina Sandhill

GEORGE L. BENSON AND G. T. COWLEY,
University of South Carolina

Most distributional studies of soil microfungi have compared populations from relatively diverse habitats or from several similar stands. In this study, distribution of fungi in the soil of a single stand was investigated in an attempt to determine effects of different ground covers. Four presumably distinct soil habitats, pine litter, oak litter, and lichen covered, and uncovered, were detected in the sandhill in Sesquicentennial State Park near Columbia, S. C.

Soil samples from the four habitats were diluted and plated on Petri dishes of Martin's medium. After incubation for five days, 30 random colonies were isolated from each sample. Populations isolated from samples taken from under oak and pine litter were similar to each other, but differed considerably from populations isolated from uncovered and lichen covered soils.

Penicillium and *Aspergillus* were the most common genera isolated from each habitat. Mucorales were generally limited to soils under pine and oak litter. *Aspergillus fumigatus* was isolated most frequently throughout the study area.

(114)

Distributional Ecology of the Spiders of the North Carolina Piedmont Old-Field Succession

JAMES W. BERRY, *Duke University and the
Institute of Marine Science, Miami*

Using the sweeping technique, litter analysis, and pit-fall traps, eight types of old-field communities on upland well-drained sites and three types of bottomland communities were sampled 20 times over 12½ months. Generally, different spider faunas were found in forest and non-forest communities. The species assemblages of the field communities showed a great similarity when compared to each other. The spiders of the forest communities showed inter-community variation; however, within the forest communities several spiders were restricted to either upland or bottomland stands, and others to either pine or hardwood communities. Of the 326 species taken in the Piedmont, the lowest number found in any community was 97; the highest, 133. There was a gradual increase in the total spider populations with each advancing phase of the old-field succession. However, the greatest abundance of spiders was found, not in the hardwood climax, but earlier, in the mixed pine-hardwood community. Evidence for the ecological separation of closely related species is given.

(118)

Feeding by Ctenophores and Its Effect on Zooplankton

JOHN W. BISHOP, *University of Richmond*

Rates of feeding by the ctenophore *Mnemiopsis* were measured in order to evaluate the impact of predation by ctenophores on populations of zooplankton. Ctenophores and copepods, mostly *Acartia tonsa*, from the Patuxent River and waters near Solomons, Maryland were used in the experiments. Rates of feeding were

correlated positively with the product of the body size of ctenophores and concentration of copepods. A regression model, based on this relationship, was used to predict the rates of feeding by the ctenophores in their natural habitat. According to the predicted values and estimates of the abundance of ctenophores and copepods, ctenophores eat 21% of the population of *A. tonsa* per day during the summer in the Patuxent River. This value accounts for approximately 40% of the summer mortality of *A. tonsa*.

(12)

Vascular Plant Flora of Beaufort County, North Carolina

AARON BLAIR AND JAMES W. HARDIN,
North Carolina State University

Approximately 1300 collections were made between September 1965 and October 1966 in Beaufort County, in the east-central Coastal Plain of North Carolina. A total of 943 species have been found, 200 of which represent new county records. Most species were typical of Atlantic Coastal Plain vegetation, although species with more western or northern affinities were found.

(121)

Retention of Zinc-65 in Population of *Drosophila melanogaster*

PAT I. BROWN AND JOHN M. CARPENTER,
University of Kentucky

Drosophila melanogaster adults from an inbred wild population were placed in food vials containing Zn^{65} media and yeast suspension for a feeding period of 48 hours. Flies were then removed, weighed and the isotope present counted in a well-type scintillation counter. After counting they were transferred to vials of media containing no isotope. This procedure was continued at twenty-four hour intervals. Average measurements of the Zn^{65} present based on counts per minute per milligram was 4104 at the start of the experiment. It was possible to detect the isotope for a period of 792 hours (33 days) at which time count had decreased to 167 per minute per milligram when all flies were dead.

The biological half-life was 2.67 days. The flies rid themselves of the Zn^{65} rapidly until the biological half-life was reached; after this, evidence for retention was displayed. Exact length of time for retention was not obtained since all flies were dead before the isotope had completely disappeared.

(9)

Remarks Concerning the Endemics of Tygarts Creek Gorge, Carter Co., Kentucky

EDWARD T. BROWNE, JR., *University of Kentucky*

Since the discovery of *Taxus canadensis* Marsh. in the gorge of Tygarts Creek, other species of very restricted range in Kentucky have been noted from this area. Through the work of Dr. Lucy Braun and others we now know of about twelve species of vascular plants which occur here and nowhere else in the state as well as others of somewhat greater, although restricted, range. The occurrence of these species is thought by some to be the result of their survival during glaciation. While some evidence supports this belief, other evidence may indicate a different explanation. Information in support of

the refugium theory and another possible explanation is to be presented.

(6)

A Correlation of Oak Hybridization and Glacial Geology on Cape Cod, Massachusetts

C. JOHN BURK, *Smith College*

A frequent complication attending studies of oak biosystematics is the presence, in any given study area, of several interfertile oak species. Over large portions of the glaciated sections of Outer Cape Cod, Massachusetts, however, *Quercus velutina* and *Q. illicifolia* are the only species within the subgenus *Erythrobalanus*. *Quercus velutina* is the only *Erythrobalanus* growing on those portions of the Outer Cape formed since the last glaciation. Although obvious hybrids of these species are infrequent, populations of *Q. velutina* on the glaciated sites tend to approach *Q. illicifolia* in a number of taxonomic characters and to be more variable than populations of *Q. velutina* growing on post-glacial sites where *Q. illicifolia* is absent. Relationships of the systematics of eastern North American *Erythrobalanus* to glacial, post-glacial, and recent history will be discussed.

(58)

Immunoelectrophoretic Analysis of Plasma Proteins of Posthatchling and Adult *Passer domesticus*

FRANCIS M. BUSH AND CHARLENE A. SEIBERT,
Medical College of Virginia

White rabbits synthesized antibodies after injections of total plasma proteins of 18 day hatchling and adult House Sparrows. Plasma from sparrows of various ages electrophoresed and reacted with rabbit anti-sparrow plasma sera revealed adults produced more lines of precipitation than younger specimens. Adult patterns exhibited greater precipitation and stained more intensely than those of young. This suggests quantitative differences during development.

Cross reactions showed hatchling and adult plasmas had several similar lines of precipitation. This indicates continual synthesis in adult plasma of some earlier differentiated proteins. Patterns of five day hatchlings had fewer lines of precipitation than those of 18 day hatchlings. This suggests progressive synthesis of proteins after hatching. Reactions of adult sparrow and chicken plasmas with the antisera of each species showed about one-fifth of all proteins to be similar. But sparrow and human plasmas failed to react reciprocally. (Supported by A. D. Williams 3558(555) and N. I. H. Grant GM 13649-01(3792)).

(30)

Reaction of *Helenium amarum* to Gibberellic Acid

DONALD CAPLENOR AND DAO CONG NHU, *Tennessee
Technological University and George Peabody College*

Gross responses of the species *Helenium amarum* (Raf.) H. Rock to various dosages of gibberellin, as a substitute for long photoperiods, were studied. Gibberellin $A \pm X$ ($GA_1 + GA_3$) and potassium salt of gibberellic acid (KGA_3 , 75% acid) were used. The calculation of the concentration of KGA_3 was based upon the acid part of KGA_3 only. Results are summarized as follows:

1. The elevation of rosette leaves required a minimum of 0.0025 microgram/plant of $GA_1 + GA_3$ or KGA_3 .
2. The elongation of rosette leaves required a minimum of 0.0025 microgram/plant of $GA_1 + GA_3$ or KGA_3 .
3. Initiation of bolting required a minimum of 0.511 microgram/plant grown on agar ($GA_1 + GA_3$) or 0.522 microgram/plant grown on soil ($GA_1 + GA_3$) or 0.412 microgram/plant (KGA_3).
4. Initiation of flower formation required a minimum of 1.482 microgram/plant of $GA_1 + GA_3$ or 1.450 microgram/plant of KGA_3 .

It was concluded that the elevation and elongation of rosette leaves may serve as criteria for the bioassay of gibberellin. At the 5% level of significance, responses were significant with each 10-fold increment of gibberellin concentration. The Log dose/Log response curves are linear in the range from 0.0025 to 0.25 microgram/plant.

(141)

Chromosome Numbers in the Genus *Draparnaldia*

JACK W. CARROLL AND T. R. DEASON,
University of Alabama

Three species of *Draparnaldia* Bory, a green, ulotrichalean alga, were grown in Bristol's medium at a temperature of about 22 degrees C. The algae received 300 foot candles illumination from soft-white fluorescent bulbs on a 12 hr.-12 hr. light-darkness cycle. Under these conditions, the algae divided cynchronously, and chromosome counts of 13 were obtained in all three species using an abbreviated aceto-orcein technique.

(19)

Ecological-Genetic Aspects of South Amherst *Drosophila* Populations

J. E. CARVER, JR., *University of Kentucky*

In order to evaluate the influence of various ecological parameters on the genetic structure of *Drosophila* populations, studies were begun to determine whether or not *Drosophila melanogaster* (and other species) are continuous in the South Amherst, Massachusetts locale. If the flies do overwinter, an *a priori* expectation is that the process involves a high degree of genetic adaptation which may be reflected by a difference in frequency, viability, and variance values for drastic heterozygotes in overwintering versus peak summer-fall populations. Results thus far reveal that *Drosophila algonquin*, *funbris*, *putrida* and *quinaria*, and *Chymomyza amoena* over winter in a non-adult stage in apple orchard soil at temperatures approaching but not reaching 0° C. The frequency of lethal-bearing second chromosomes in *D. melanogaster* was lower in samples from the smaller spring population. Viability and variance analysis reveals an irregular pattern of statistically significant and nonsignificant differences, the meaning of which will require analysis of additional samples now under study.

(90)

The Development of the Ovule and Megagametophyte in *Luzula bulbosa* (Wood) Rydb.

JANICE C. COFFEY AND J. M. HERR, JR.,
Clemson University at Sumter and University of South Carolina

A single, hypodermal archesporium differentiates after initiation of the inner integument in the slightly curved ovule of *Luzula bulbosa* (Wood) Rydb. and divides unequally to produce a parietal and sporogenous cell. By enlargement the sporogenous cell forms the megasporocyte. Two cells produced by anticlinal division of the parietal cell enlarge markedly through the course of meiosis, formation of the linear tetrad, and early megagametogenesis from the chalazal megaspore. Concomitantly, the crassinucellate nucellus expands laterally by periclinal cell divisions, the outer integument emerges and elongates, and the ovule assumes anatropous form. The chalazal nucleus of the 2-nucleate megagametophyte enlarges to marked hypertrophy as the micropylar nucleus divides twice and ultimately establishes the egg apparatus and a polar nucleus. The absence of vacuoles in the synergids is another unusual feature. With maturation of the megagametophyte, the cells of the inner integument develop secondary walls while those of the outer integument remain parenchymatous and proliferate at the apex to initiate the caruncle, a prominent structure in the mature seed.

(44)

Effects of Actinomycin-D on Nucleic Acid Synthesis in Grasshopper Neuroblasts

MADISON B. COLE, JR., RALPH E. STEPHENS, AND
J. GORDON CARLSON, *The University of Tennessee*

Embryos of the grasshopper, *Chortophaga viridifasciata* (DeGeer), equivalent to 14-15 days development at 26° C., were placed in a culture medium containing known concentrations of the antibiotic, actinomycin-D, and 10 microcuries per milliliter of tritiated uridine. At the end of ½, 1, 2, 4, and 8 hours in culture, the embryos were fixed in 50 percent acetic acid, squashed, and prepared for autoradiography. Analysis of the autoradiographs indicates that uridine uptake (ribonucleic acid synthesis) by neuroblasts is reduced significantly by one hour exposure to one to two micrograms (8 to 16 x 10⁻¹⁰ M) of actinomycin-D per milliliter of culture medium at 38° C. Effects of actinomycin-D on thymidine uptake (deoxyribonucleic acid synthesis) are being investigated. The results of these studies and their possible implications will be discussed. (This study was supported in part by the Atomic Energy Commission under contract number AT-(40-1)-2575.)

(80)

Habitat Factors Associated with Mountain Disjuncts in the Eastern Piedmont of North Carolina

ARTHUR W. COOPER AND JAMES W. HARDIN,
North Carolina State University

An interesting floristic pattern observed in North Carolina involves species which show Mountain-eastern Piedmont disjunctions. There are certain unique features of the environment of the eastern Piedmont where these disjuncts occur. Climatic data suggest that this region has lower temperatures, shorter frost-free season, and higher rainfall than adjacent areas in the interior Piedmont and Upper Coastal Plain. The topography of the eastern Piedmont is more rugged than adjacent regions. The soils of the region are not so heavily weathered as those in the interior Piedmont and Upper Coastal Plain, as judged by evidence from clay accumulation and base status. The topographic and soil features are probably

related to stream cutting periods of lower sea level. Considered collectively, these features seem sufficient to account for the local persistence of the Mountain species from a time of continuous distribution during the Wisconsin period of Pleistocene glaciation.

(132)

Vertical Distribution of Microfungi on Two Trees in the Luquillo Experimental Forest, Puerto Rico

G. T. COWLEY, *University of South Carolina*

Leaf samples taken from the bottom, middle and top of a *Dacryodes excelsa* tree and a *Manilkara nitida* tree were investigated for microfungi on or within them. By a dilution plate method, population sizes were estimated and 25 random colonies were isolated from each sample. At the time of sampling, five Petri dishes of Martin's medium were exposed to the atmosphere for 15 minutes at each of four elevations; ground level, 30 ft., 48 ft., and 66 ft. The last elevation was above the forest canopy.

Little correlation could be made between plate counts and elevation on *Dacryodes* leaves, but on *Manilkara* leaves, plate counts decreased significantly with height. Fewer species were isolated from the top of either tree than from lower levels. Similarly, the number of colonies and species on plates exposed to the air decreased with elevation.

A degree of specificity of fungal species for tree species was apparent, and the fungal species composition was more uniform of *Manilkara* than on *Dacryodes*.

(81)

Preparation of ^{14}C Labeled Grass for Use in Evaluating Organic Turnover in a Prairie Ecosystem

ROGER C. DAHLMAN, *Oak Ridge National Laboratory, Oak Ridge, Tenn.*
CLAIR L. KUCERA, *University of Missouri*

Carbon-14 is a useful tracer to use in studying organic cycling processes of the ecosystem. Simple technique and inexpensive apparatus are described for obtaining ^{14}C labeled grass plants under both laboratory and field conditions. Radiocarbon was incorporated into root and shoot systems of prairie grasses *in situ*. Regenerated foliage, as the result of clipping 6 weeks prior to exposure, contained 7 times more ^{14}C than maturing vegetation, indicating a greater photosynthetic rate. In mature vegetation, however, a proportionately greater amount of the total photosynthate was translocated to the root system. The roots were adequately labeled with ^{14}C for subsequent study of turnover, transfer, and decay processes.

Organic materials, possessing a somewhat higher specific activity (43 microcuries per gram of carbon), were obtained by growing prairie grasses from seedling to maturity in a closed system using an inexpensive plexiglass growth chamber. More ^{14}C was present in shoots than roots. Both materials were used in decomposition and carbon transfer studies. (This study was supported by National Science Foundation Grant 702 and University of Missouri Research Council Grant 160.)

(109)

Ultrastructure of the Caecum of *Haematoloechus medioplexus*

DONALD A. DAVIS, B. J. BOGITSH AND D. A. NUNNALLY, *Vanderbilt University*

The ultrastructure of the lining of the caecum of *Haematoloechus medioplexus* is investigated with a Phillips 100-C electron microscope. The lining is cellular possessing large sparse nuclei each with a prominent nucleolus. Numerous elongated cytoplasmic processes believed to facilitate endocytosis are found extending from the surface of these cells. Many large, irregularly shaped mitochondria are demonstrated which often contain intramitochondrial granules. Extensive rough endoplasmic reticulum is shown throughout the cells. Vacuoles of various sizes are present. Some vacuoles are bounded by rough endoplasmic reticulum and are presumed to be lysosomes. Other more dense vacuoles are generally smaller and are thought to contain secretory products. There is no indication of secretory and absorptive cycles in the animal. (Supported, in part, by National Science Foundation Grant GB-4742.)

(111)

Some Effects of Specific and Nonspecific Proteolytic Enzymes on the Notochordal Sheath of Bullfrog Larvae

JOSEPHINE DELANEY AND ROY HUNTER, JR., *Atlanta University*

The precise origin of the bilaminar notochordal sheath in larval amphibians has been in dispute for many decades. Much of the confusion has been due to a lack of reliable information on its chemical composition. In an effort to clarify some of the data, the procedure of enzymic hydrolysis was employed. Specific and nonspecific proteolytic enzymes were used on thin sections of tails from bullfrog larvae. Prolonged exposure to trypsin and elastase resulted in general tissue disruptions. The elastic lamella of the sheath was unaffected by elastase and other enzymes. The inner fibrous lamella and the basement membrane under the epidermis were completely hydrolyzed by collagenase. The data have been interpreted to mean that the inner lamella of the sheath is collagenous; that the outer lamella is nonelastin in nature.

(8)

The Epiphytic Orchids of Honduras, II

ROBERT A. DIETZ, *Troy State College*

The initial phase of a study of variation in Honduras epiphytic orchids is complete after three collecting trips to that country between 1965 and 1967. Polyploid complexes have tentatively been identified in *Cattleya* and *Oncidium*. A species list has been prepared, with annotations, containing 63 genera and 388 species, for distribution at the meeting. (Supported in part by grants from Troy State College, and the Alabama Academy of Science.)

(17)

Studies of the Exchange of Trace Elements Between Estuarine Sediments and Water

THOMAS W. DUKE, JAMES N. WILLIS, AND DOUGLAS A. WOLFE, *Bureau of Commercial Fisheries, Radiobiological Laboratory, Beaufort, North Carolina*

A radioisotopic technique was developed for the study of elemental exchange between cores of estuarine sediments and overlying estuarine water. Sediments are collected in a coring device constructed with a lucite cylinder which is plugged and detached after a core is taken. After equilibration of the cores with estuarine water, the cylinder is slipped into the well of a lead shield constructed so that radiation from only a narrow wedge of the water column is measured. Radioactive tracer is added to the water in the cylinder and the concentration of radioactivity, measured with a 3-inch crystal and single-channel spectrometer, is recorded instantaneously and continuously. Exchange rate on an areal basis is calculated from the initial specific activity and loss of the isotope from the water. The exchangeable amount of the element in the sediment is determined from the specific activity in the water after the tracer in the water has equilibrated with the sediments.

(139)

Deep Water Algae in the Gulf of Mexico

SYLVIA A. EARLE, *Cape Haze Marine Laboratory and Farlow Herbarium, Harvard University*

Most benthic marine algae occur in depths of less than 30 meters, but certain species are known to grow in depths exceeding 100 meters. Species known to range into both shallow and deep habitats in the Gulf of Mexico are listed and compared with species known only from deep water. Special note is made of recent collections taken in 55-60 meters of water in the vicinity of the Dry Tortugas, Florida from the R/V ANTON BRUUN, and previous records of algae taken from deep water in the Gulf are reviewed. The theory of chromatic adaptation is briefly discussed.

(73)

The Role and Status of Kudzu in the Southeast

JOE A. EDMISTEN AND HENRY F. PERKINS, *University of Georgia*

Experiments were done to investigate the role of kudzu (*Pueraria lobata*) in changing the physical and chemical characteristics of soils and to establish the productivity and protein content of this legume. Experiments were done in which the rates of the extension of kudzu into forested and bare areas were established. Other experiments were done to ascertain the protein content of kudzu and to investigate the feasibility of utilizing its leaves as a source of human food. The rate of spread of kudzu appears to have been exaggerated due to its dramatic clinging aspect. Productivity ranged from 5600 lb/acre/yr to 9606 lb/acre/yr. Kudzu's greatest impact on the soil is physical, but small amounts of NH_3 and NO_3 are added to the soil after frost kills it. The nitrogen content of kudzu leaves was $2.8\% \pm 0.18$ or about 18% protein. The leaves of kudzu were cooked in several manners and were found to be palatable.

(1)

Genetic Fruit Polymorphism in *Valerianella* (Tourn.) Mill (Valerianaceae)

DONNA MARIE EGGERS, *Vanderbilt University*

Valerianella ozarkana Dyal and *V. bushii* Dyal, endemics to the Ozarks Region, can be differentiated solely on the basis of the striking difference in the morphologies of their indehiscent fruits. The fruit of the first has three prominent keels, one dorsal and two ventral, with a conspicuous line of hairs along the edge of each keel, in contrast to the fruit of the second which has no keels. Both types of fruit never occur on the same individual. These plants are commonly found growing in mixed colonies, and they flower simultaneously. Tests utilizing samples of fruits of both types show that among the plantings of a particular fruit-type a few of the progeny produce fruits with the other morphology. Thus, this "species-pair" actually represents a sibling relationship within one genetically dimorphic species. The possibility of fruit polymorphism in another species-pair, *V. umbilicata* (Sulliv.) Wood and *V. patellaria* (Sulliv.) Wood is also discussed.

(57)

Molecular Hybridization of Human and Pigeon Hemoglobin

W. DONALD FATTIG AND DAIL W. MULLINS, *Southwestern at Memphis and Memphis State University*

Mixtures of human and pigeon hemoglobin (carbon-monooxy form) were dialyzed against acetate buffer (pH 4.2) for eight hours, then against a tris-citrate-borate buffer (pH 8.5) for six hours, at room temperature. The resulting mixture, together with controls of unmixed pigeon and human hemoglobin which had been treated identically, were subjected to starch-gel electrophoresis. The gels were stained with benzidine dichloride, an iron-specific stain, to reveal the migration positions of the hemoglobins. The results indicate the formation, under the above conditions, of two kinds of "new" molecules in the mixture. The observations suggest that, as with mixtures of human and canine hemoglobins, the parental species of molecules dissociate at low pH into alpha and beta chain dimers which randomly reassociate at higher pH. The recombining ability of these molecular subunits supports the generalization that vertebrate hemoglobins have a similar quaternary structure.

(96)

Use of the Appendix Masculina as a Taxonomic Character in the Shrimp *Palaemonetes*

LAURENCE E. FLEMING, *Mississippi State University*

The American species of *Palaemonetes* are currently identified by characters based on spinosa and tubercular ornamentation of several different body sites. Because of variation and overlap, identification and relationships are difficult to determine. In many Malacostraca, structures used in amplexus, particularly male appendages, have been useful in taxonomic and evolutionary studies. In *Palaemonetes* the first two pleopods exhibit sexual dimorphism. The second pleopods of the males bear an accessory ramus, the appendix masculina. Setal ornamentation of the appendix masculina is apparently unique and stable. Thus, these features are of potential value for systematic study of the Palaemonidae, perhaps

even as significant as are the appendage modifications in such groups as Astacidae, Asellidae, and Entocytheridae. (This research was supported in part by NSF Grant No. GB-4719 to Dr. J. F. Fitzpatrick, Jr.)

(29)

Histochemical Effects of Indole-3-Acetic Acid and Kinetin during Megagametogenesis in *Lilium*

FRANKLIN F. FLINT, *Randolph-Macon Woman's College*

Floral buds of *Lilium candidum* treated with Indole Acetic Acid, Kinetin, and a combination of both show effects of this treatment during megagametogenesis. The general effect in each treatment was a retardation of the developmental stages. Indole Acetic Acid-treated plants showed the least retardation (25-30%), and Kinetin-treated the most (40-50% or more). The megagametophyte of Kinetin-treated plants did not mature, many ovaries aborted, and there was one example of twin sporocytes being initiated in one ovule. Cellular protein concentration as measured by the mercuric brom phenol blue method showed no consistent variations between treated and non-treated specimens. Carbohydrate concentration in the ovary wall, as measured with the PAS reagent, during megagametogenesis varied considerably with the kinetin-treated groups having a greater quantity and distribution. IAA-treated material had less than the control groups, although it persisted for a longer period of time.

There is a good correlation between the retardation of megagametogenesis in the treated material with the quantity and persistence of carbohydrate accumulation in the cells of the ovary wall. Kinetin has the greater effect.

(56)

Comparative Aspects of Peromyscus Hemoglobin Ionographic Properties

CHARLES W. FOREMAN, *The University of the South*

Ten species of *Peromyscus* sampled to date from eleven different sites from Arizona to Pennsylvania have shown different proportions and combinations of four electrophoretically separable hemoglobins. One species, *P. gossypinus*, shows genetic hemoglobin polymorphism in each of three separate populations. Another, *P. Leucopus*, has shown only one departure from the usual type among over 100 specimens from five sites between Pennsylvania and Texas. Two species, *P. nuttalli* and *P. eremicus*, have single hemoglobins, and the others have multiple hemoglobins. Much of these data have been published in three separate papers; however, original data will be included for four species and four subspecies from three states upon which I have made no previous public report. (Supported by NSF GB-2391 and GB-4639.)

(53)

Phenothiazine Derivatives and Biological Pregnancy Tests Using *Rana pipiens* and *R. clamitans* as Test Animals

BERYL C. FRANKLIN, *Northeast Louisiana State College*

A total of 109 hospitalized mental patients were divided into three groups by age. Pregnancy tests were performed to determine the interference, if any, by tranquilizing drugs of the phenothiazine group. Nine false-positive tests were elicited when *Rana pipiens* was the

test animal, only one when *R. clamitans* was used. *R. clamitans* was compared to *R. pipiens* in only one group. The results indicate that when the subject is using phenothiazine derivatives, a biological pregnancy test is more reliable when using *R. clamitans* rather than *R. pipiens*.

(110)

Specificity of Action of Proteolytic Enzymes (Histological Evaluation)

WILLIAM W. NORRIS, *Northeast Louisiana State College*

The specificity of action of papain and ficin on structural aspects of muscle tissue was investigated histologically. Skeletal muscle from fish, amphibians, reptiles, birds and mammals was quickly quenched at -79° C., sectioned in a cryostat, placed on microscope slides, incubated with enzyme solutions of known concentration, temperature, and hydrogen ion concentration for a prescribed interval of time. Papain and ficin hydrolyzed the sarcolemma, sarcoplasm, myofibrils of skeletal muscle of all forms tested. Both enzymes exhibited limited hydrolytic action on the nuclei of muscle fibers. Papain and ficin attacked the endomysium, perimysium, and epimysium, but apparently had reduced action on the nuclei of fibroblast. The cytological changes elicited by these enzymes are compared to the changes induced by heating alone or by low or high hydrogen ion concentration.

(2)

Trillium maculatum Raf. and Related Taxa of Sessile-flowered *Trillium*

JOHN D. FREEMAN, *Vanderbilt University*

Since 1753, more than fifty specific or varietal names have been proposed for sessile-flowered *Trillium*. Because of this burdensome synonymy, there exists little agreement among taxonomists as to the valid names for various taxa. Much of the taxonomic confusion concerning the sessile trilliums of the southeastern states involves the entity to which the name *T. maculatum* Raf. should apply. The present study, based on field work in 17 eastern states and supplemented by examination of herbarium specimens and types, has shown that *T. maculatum* may be distinguished from other species having sessile flowers, including *T. underwoodii* Small — a valid name often relegated to synonymy. These two species occupy much the same geographic range in the southeastern coastal plain where sympatric populations are not uncommon. Evidence of hybridization between the two is lacking and in view of their consistent morphological differences, *T. maculatum* and *T. underwoodii* should be accorded taxonomic recognition as distinct entities.

(77)

Quantitative Considerations of Ecosystem Disturbance by Gamma Irradiation

ARTHUR GARRETT, *Emory University*
(Present address, U. S. Public Health Service,
Southeastern Radiological Health Laboratory.)

Phenological and quantitative changes occurring in segments of granite outcrop ecosystems were recorded during two year's exposure to gamma irradiation. Chronic dose rates constituted a gradient from 161 to 0.8 Roentgens per hour. Changes in taxonomic composition of the plant and soil arthropod communities

have been quantified by means of several indexes of dominance, diversity and similarity. These index values will be considered in terms of their relationship to photographic and subjective observations. Both subjective and quantitative observations indicate the nature and extent of ecosystem disruption by radiation. In this case, many aspects of ecosystem alteration are similar to the reported effects of other stress factors. Results of the present paper support those who have suggested three phases of ecosystem response: quantitative compositional changes, alteration of dominance and extinction. Radiation is a precisely controllable environmental factor and therefore is useful as a tool in investigating the mechanisms giving rise to the general case effects on ecosystems.

(99)

Effects of Ethanol on Morphogenesis and Distribution of Glycogen in Developing *Rana pipiens*

NORMAN E. GARRISON AND J. E. DAVIS, JR.,
Wake Forest College

Rana pipiens larvae were reared under varying concentrations of ethanol for 95 hours, starting at stage 10. Studies revealed suppressed development and hatching, thoracic abnormalities (gross and histological), and altered glycogen content in all larvae. Decreased glycogen was pronounced in larvae reared in near-lethal concentrations of ethanol. These results support the hypothesis that high concentrations of ethanol cause an alteration in glycogen content and, consequently, in development.

(54)

Separation of Mature and Immature Quail Hypothalami Extracts by Gel Filtration

R. E. GARTH, J. R. FORTMAN, AND K. J. SMITH,
Mississippi State College for Women and
Northwestern State College of Louisiana

The ICSH-releasing factor(s) of male birds is thought to be produced by the hypothalamus. Homogenates of hypothalamic material from mature and immature quail were fractionated by gel filtration on Sephadex G-25 and the fractions bio-assayed by the degree of ascorbic acid depletion in mice ovaries. Consistent differences in the gel filtrates were obtained, but mice ovaries proved to be unsuitable for use in ascorbic acid depletion tests.

(117)

The Effects of Artificial Predation on the Behavior and Population Densities of *Pogonomyrmex badius* Colonies

JOHN B. GENTRY, University of Georgia

Twenty colonies of the southern harvester ant, *Pogonomyrmex badius*, were subjected to daily removal of workers for a period of five months during the summer of 1965. Ten colonies lost 10 workers per day and 10 colonies lost 50 workers per day. Ten additional colonies served as controls. One-half (15) of the colonies were excavated at the end of the experiment to determine population densities. Daily activity among the colonies losing 50 workers per day was greatly altered in response to the artificial predation pressure. Although there was no significant difference between the controls and the treated colonies in the number of ants produced (removed plus excavated), the worker population of the 50

per day group showed, upon excavation, a 50% reduction in density. No effect in behavior or worker density among the 10 per day group was noted. The remaining 15 colonies survived the winter and showed normal behavior the next summer.

(124)

Forces Produced by Beating Flagella of *Polytomella agilis*

STEPHEN M. GITTLESON, University of Kentucky

Forces produced by the beating flagella of *Polytomella agilis* have been assessed by measuring the displacement of polystyrene spheres (0.365 μ in diameter) in suspension about the motile organism. Stokes' law relates the hydrodynamic force directly to the frictional coefficient and velocity of the sphere. Velocity of the polystyrene spheres was measured from 16 mm motion pictures taken at 50 frames/sec at 256X. The spheres had an average velocity of 36.2 μ /sec with a range from 21.3 to 52.7 μ /sec. *P. agilis* move forward at the average velocity of 80.0 μ /sec. The flagella produce a force of about 1.1×10^{-8} dynes. This agrees closely with the 3.0×10^{-8} dyne force exerted by the flagellum of *Trypanosoma brucei* on deforming a red blood cell (Holwill, 1965); and the 1.2×10^{-8} dyne force with which the large abfrontal cilium of *Mytilus edulis* beats in normal sea water (Yoneda, 1960, 1962).

(113)

The Distribution of Seastars of the North Carolina Continental Shelf

I. E. GRAY, Duke University

Twenty genera and 30 species of asterioids have been taken on the Continental Shelf off North Carolina. Nine northern species have their southern limits, and sixteen tropical and subtropical species have their northern limits of range here. Only five range both north and south. North-south transition is not indicated; species with different geographical affinities may be in different marine climates at the same latitude. Tropical species are rare north of Cape Hatteras except at the edge of the shelf under the Florida Current; boreal species are not common south of the cape. The most abundant seastars of the shelf are *Astropecten articulatus*, *Luidia clathrata*, *Astropecten americanus* and *Asterias forbesii*. Charts showing distribution in relation to biotic provinces of the shelf are presented. The 18-20 species that live in the continuously cold, deep waters beyond the shelf, although in the latitude of North Carolina, are not included. (Supported by NSF grant G-25,128.)

(10)

Sag Pond Vegetation in Northwest Georgia

PHILIP F-C. GREAR, Shorter College

Natural ponds in the Ridge and Valley province of northwest Georgia support coastal plain types of vegetation because climatic, geologic, edaphic and hydrologic factors there are similar to those of the Coastal Plain province. Twenty-three species of vascular plants previously reported only from the Coastal Plain grow there. There are twenty-five other species usually associated with the Coastal Plain which were not previously reported from the Ridge and Valley province. An additional twenty-two species have affinities with coastal plain vegetation. Six other species are related to the

vegetation of northern provinces. Vegetative zones in these ponds are mainly the product of hydroperiodic influences. Duration of hydroperiod depends largely upon the thickness of sapropelic silt deposited in the pond depressions. Relative stages of pond maturity can be recognized by distinctive elements of the vegetative zones.

(142)

A Botanical Case of Mayr's Founder Principle from the Charophyta

DANA G. GRIFFIN, III, *University of Tennessee*

Four populations of dioecious charophytes are now known wherein only one sex is present. Examination of available evidence regarding dispersal mechanisms in this group suggests (*a priori*) that these populations of haploid organisms are clonal or near-clonal, having originated from a single or very few oospores. If such is the case, they would represent rather extreme examples of Mayr's "founder population." Alternative hypotheses concerning their mode of origin are discussed.

(140)

A Further Look at the Biosystematics of *Chara zeylanica*

DANA G. GRIFFIN, III, *University of Tennessee*

Interpreted in the broadest sense, *Chara zeylanica* (Charophyta) can include populations having any one of 4 possible chromosome numbers ($n = 14, 28, 42, \text{ or } 56$). Breeding experiments, however, strongly suggest that effective biological isolation occurs between certain sub-specific taxa within this complex. The greatest morphological divergence between these taxa appears to occur in that part of the range where they are sympatric. Data from populations outside this area fail to confirm that a similar degree of divergence has taken place.

Of interest, at present, are two putative hybrids from Brazil. Suggestions as to their possible parentage are made.

(104)

Life Cycle of *Procyotrema marsupiformis* Harkema and Miller, 1959 (Trematoda: Alariinae)

ALVA H. HARRIS, R. HARKEMA, AND G. C. MILLER,
N. C. State University

Intermediate hosts involved in the life cycle of *P. marsupiformis* were determined and larval stages were described. Eggs were obtained from the pancreatic duct of the definitive host and incubated in pond water. Parasite free planorbid snails were exposed to miracidia and the resulting cercariae infected laboratory-raised tadpoles. These tadpoles containing the mesocercarial stage were fed to non-infected raccoons for the recovery of the diplostomula in the lungs and the adults in the pancreatic duct. The miracidium has two eyespots, two pairs of flame cells, and an epidermal plate pattern of 6:9:4:3. It develops into a mother sporocyst in the periesophageal blood sinus of the snail host. Mother sporocysts produce daughter sporocysts which, in turn, produce pharyngeate, longifurcous cercariae. Cercariae possess 4 preacetabular penetration glands and a flame cell formula of $2 [(2 + 2) + (2 + 2 (2))] = 20$ total.

(83)

Forest Vegetation Patterns in Southern Beaufort County, North Carolina

GARY S. HARTSHORN, *North Carolina State University*

A vegetation analysis of southern Beaufort County, North Carolina was made during the summer of 1966. The study area, located south of the Pamlico River, is in the outer coastal plain. A sandy ridge, west of the Suffolk Scrap, bisects the area. Elevation ranges from 5 to 60 feet above sea level. Relief, as it affects drainage, is the most variable of the factors affecting vegetation.

Because of the disturbed nature of the area, vegetation patterns were developed in relation to several soil drainage catenas. Soils of the Craven-Lenoir-Bladen-Bayboro catena, characterized by subsoils with greater than 45% clay, are generally dominated by hardwoods. In the Lakeland-Alaga-Albany-Plummer-Rutledge catena, characterized by sandier subsoils, pines dominate the drier sites with broad-leaved evergreens and hardwoods in moister situations.

(15)

Toxicity of Endrin to *Gambusia affinis*: A Comparison of Static and Flow-through Bioassay Systems

JOHN R. HEBERT, BOBBY F. DOWDEN, HARRY J. BENNETT,
Louisiana State University and Mississippi State College for Women

Toxicity threshold values for *Gambusia affinis* subjected to endrin indicate that values measured in a static bioassay system are significantly greater than those measured in a flow-through system. The usefulness of toxicity thresholds measured in static systems is questionable. All the values measured were significantly lower than endrin concentrations purported to constitute no hazard to wildlife.

(101)

A New *Hystrichis* (Nematoda: Dioctophymidae) from the Common Crow

LARRY HENDRICKS, *North Carolina State University*

One hundred and fifteen crows (*Corvus branchyrhynchus*) were collected in North Central North Carolina on April 23, 1966 in conjunction with the Southeastern Crow Hunting Association's Annual Hunt. Twenty specimens of the nematode genus *Hystrichis* were recovered from the lining of the esophagus. Morphological characters appear to be sufficiently different from the known species of *Hystrichis* to warrant description of a new species. North America represents a new locality record for this genus of nematode. This is also the first record of birds in the Order Passeriformes serving as hosts for this nematode in the New World.

(92)

An Innovation in the Paraffin Embedding Technique for the Preparation of Excised Angiosperm Ovules

J. M. HERR, JR., *University of South Carolina*

Accurate determination of spatial relationships in developing ovules from several species has been enhanced by a new technique for precise and repeatable selection

of specific section planes. Ovules removed from fixed ovaries to a glass planchet and prestained in 0.5% safranin in 70% ethanol for ten minutes are advanced at ten minute intervals through a tertiary butanol series. The planchet containing absolute tertiary butanol is transferred to a covered petri dish on a warming table. Chips of aerated paraffin are added over a period of thirty minutes, and the petri cover is then removed. After the alcohol evaporates, the ovules are transferred to fresh paraffin in a special flat dish coated with RTV 60 silicone rubber and, viewed through a dissecting microscope, are then precisely and uniformly arranged on the flat bottom of the dish. The dish is then rapidly cooled. The paraffin cast is shaped for sectioning so that the flat surface against which the ovules are positioned remains unaltered and becomes the front face of the section block. With the alignment of the front face perpendicular to the cutting edge of the knife, the predetermined section plane for the ovules is achieved. The technique is illustrated for ovules from *Ludwigia uruguayensis* (Camb.) Hara.

(74)

The Ecological Status of *Pinus Strobus* L. in Ogle County, Illinois

W. S. HOOKS, *Lynchburg College*

An unusual distribution of *Pinus strobus* L. in relationship to topography and certain meteorological phenomena raised the question as to the ecological status and origin of the only *P. strobus* stand in the State of Illinois. This stand has been referred to in literature as the extreme southern extension of the Wisconsin *P. strobus* forest. Investigations were initiated in 1956 and concluded in 1966. The techniques of dendrochronology were applied to the stand. A witness tree survey of the study area was made. Presently, developing growths of *P. strobus*, on similar topography and under the same meteorological influences have been observed.

Results indicate that the stand is not natural but has developed following the settlement of the area by white man and was due to his interruption of the normal ecological situation.

(16)

Metabolic Rates of Estuarine Fish

DONALD E. HOSS, *Bureau of Commercial Fisheries
Radiobiological Laboratory, Beaufort, North Carolina*

The resting metabolism of pinfish (*Lagodon rhomboides*), black sea bass (*Centropristes striatus*), Atlantic croaker (*Micropogon undulatus*), and oyster toadfish (*Opsanus tau*) was measured in the laboratory by means of a flowing-water respirometer. Resting metabolism was related to body weight by the equation $Q = aW^k$, where Q is the metabolic rate, W is the weight of the animal, and the values of a and k are constants derived from experimental data for a species. Some investigators also have stated that k values of various species do not vary significantly from 0.8. This value for k has been used to calculate the resting metabolism of certain species of fish when a was determined experimentally. In my investigations the value of k fluctuated significantly between species. The value 0.8 cannot be used as a constant in calculating metabolic rates for all species of fish for reasons discussed.

(98)

Staining Techniques for the Endocrine Pancreas

ERNEST L. HUNT, *Emory University*

Excellent and specific techniques are available for the identification of cell types of the islets of Langerhans, but these techniques have been mainly developed for use with mammalian tissue. In a comparative study of the pancreas from other vertebrates the standard methods are not uniformly satisfactory. This report will indicate certain modifications of routine techniques which have proved useful particularly in the study of fish and of bird pancreatic cell types. The major modification to be discussed is a very rapid method using the standard Gomori aldehyde fuchsin, but substituting Ehrlich's acid hematoxylin for the more usual nuclear stain.

(52)

Possibility of Beryllium-Manganese Antagonism in Amputated Forelimbs of *Triturus viridescens*

DIANE SUE IMHOFF AND RICHARD E. GARTH,
Mississippi State College for Women

The alterations in the histological pattern of normal salamander limb regeneration which are brought about by beryllium have been previously described. The exact mechanism of this alteration is unknown. The alkaline phosphatase system which may be involved in regeneration has been shown to be inhibited by beryllium *in vitro*. This inhibition can be removed by the addition of manganese. Bilateral amputation of salamander forelimbs and subsequent treatment with various combinations of beryllium and manganese indicate that reversal of beryllium inhibition by manganese is involved *in vivo*. The tentative conclusion is that the alkaline phosphatase system utilized magnesium as an essential activating ion which can be displaced by beryllium. The beryllium in turn can be displaced by manganese which allows a return to normal alkaline phosphatase activity.

(119)

The Reproductive Potential of *D. affinis*

WILLARD JINKS, *Indiana Central College*

The study of the reproductive potential of *D. affinis* has produced new insight in population studies. Previous investigators have suggested that food yeasts are species specific to the flies involved and may affect reproduction. A study of the fecundity, longevity, viability, and generation time indicates a preference for a yeast as food but not a necessity. The data are as follows: fecundity 136-310 eggs/female, generation time — 14 days, average viability — 63%. Of the larvae ready to pupate — 40%-60% undergo diapause or die in the pupal stage. Unlike *D. melanogaster* which can reproduce in the total darkness, *D. affinis* requires light of a certain intensity and duration in order to maintain maximum fecundity. Preliminary data indicates that *D. affinis* slackens egg production in total darkness. An additional experiment suggests that *D. affinis* requires a minimum volume of space per individual, and preliminary data indicate that when a population is crowded into a small space, fecundity decreases.

(23)

Green Tissues Among Neotropical Frogs

DUVALL A. JONES, *West Liberty State College*

Green pigmentation of bone and other internal tissues of live and newly preserved tropical frogs has been a topic of curiosity for nearly a century. Biliverdin and perhaps other pigments of hemoglobin metabolism appear to be responsible for the green coloration. Since these pigments deteriorate rapidly in preserved specimens, fresh material of more than thirty-five anuran species was studied in the West Indies and Surinam. Adults of sixteen species had green bones; of these, certain species consistently demonstrated plasma and tissues that were variously saturated hues of green. Tadpoles ordinarily lack the green coloration until the onset of metamorphosis. The incidence of green pigmentation is difficult to correlate with phylogeny, ecology, diet, red blood cell count or concentration of blood hemoglobin. Difficulty in determining the cause of pigment accumulation may be due to formation of similar pigments by different mechanisms in the species concerned.

(7)

Habitat Hybridization in *Vernonia* (Compositae)SAMUEL B. JONES, JR., *University of Southern Mississippi*

A hybrid swarm of *Vernonia* was found on a habitat which was intermediate between the habitats of the two parents (*V. angustifolia* Michx. and *V. altissima* Nutt.) and to which neither parent was as well adapted as the hybrids. *Vernonia angustifolia* was on a high, dry, sandy, turkey oak-longleaf pine bluff while *V. altissima* was on the edge of a wet swamp forest. These habitats were connected by a highway fill which provided a variety of intermediate ecological situations. This population was observed over a period of five years. Local population samples were collected and experimental crosses were made. When man creates a disturbed or hybridized habitat, hybridization often occurs between species of *Vernonia*, which share the same general geographic distribution but are usually separated by ecological barriers.

(46)

The Luteolytic Effect of Resectioned and Rejoined Pseudopregnant Hamster Uteri

GEORGE C. KENT, JR., *Louisiana State University*

Hysterectomy of hamsters rendered pseudopregnant by sterile mating results in prolongation of hyperemia of the corpora lutea of pseudopregnancy (PS) and postponement of the next psychic estrus until $15.85 \pm .39$ (S.E.M.) days after sterile mating ($N = 78$). Total resection of pseudopregnant uteri followed by immediate rejunction of the uteri in situ on days 1, 2, or 3 of PS gave the same result ($15.59 \pm .42$ days, $N = 32$). Resection and immediate rejunction on days 5, 6, or 7 of PS shortened the duration of PS to $11.58 \pm .50$ days ($N = 31$). To test the hypothesis that the synthesis or release of a luteolytic substance of uterine origin depends partly on intact uterine innervation (aff. or eff.?) on day 4 of PS, pseudopregnant hamsters were treated with analgesic agents during part of day 4 and the subsequent effects on the corpora lutea and on PS were observed. The results of these observations will be discussed.

(93)

A Preliminary Report on Floral Induction in Seedlings of *Chenopodium album* L.T. W. LUCANSKY AND J. M. HERR, JR.,
University of South Carolina

Chenopodium album L., a short day plant, often grows a meter or more in height before flowering in response to the diminishing photoperiod from June through October. Under controlled conditions, floral induction has been achieved in plants 12 to 24 inches in height by altering the daily photoperiod from 17 hours to 7 hours. In an attempt to induce flowering with further reduction in vegetative growth, seeds obtained from plants grown in nature, in the greenhouse and in growth chambers were planted in sand supplied with minerals and maintained on 2-, 4-, and 6-hour photoperiods. Seeds produced in the growth chambers showed a higher percentage and rate of germination than those from nature or the greenhouse. Seedlings in the 2-hour photoperiod showed extreme etiolation and negligible growth of the epicotyl. Those in the 4-hour regime, slightly etiolated, flowered after producing an average of 21.6 leaves, to include cotyledons, with the average length of the epicotyl 43.7 mm. Seedlings grown in the 6-hour photoperiod were not etiolated and flowered after the epicotyl grew to an average 8.3 mm. with an average leaf number of 12.1. At flower initiation, the smallest seedling had produced 6 leaves and an epicotyl less than 1 mm. long.

(33)

Photosynthesis in Relation to Chlorophyll Content, Stomatal Distribution, and Hill Reaction Activity in Shade and Sun Ferns

C. JOSEPH LUDLOW AND FREDERICK T. WOLF,
Vanderbilt University

Photosynthetic data, including compensation points, light saturation intensities, and maximal rates of photosynthesis have been earlier determined in two species of ferns which grow in the shade (*Asplenium platyneuron* and *Woodsia obtusa*), and in two sun species (*Botrychium dissectum* and *Pellaea atropurpurea*). It was shown that the quantity of chlorophyll was considerably higher in the shade species. Proportionality between chlorophyll content and photosynthetic rate was found in only one species. Both stomatal number and maximal photosynthetic rates were higher in the sun species. Hill reaction activity of isolated chloroplasts, followed spectrophotometrically by reduction of 2,6-dichlorophenolindophenol was found to correlate well with maximal photosynthetic rates, both of which are higher in sun than in shade species.

(120)

Studies on the Life-History of the Damselfly *Lestes eurinus*PAUL E. LUTZ, *University of North Carolina at Greensboro*

Extensive field studies were conducted in 1965-1966 in a small woodland impoundment in Guilford County, North Carolina. These studies indicated the duration of the life cycle of *Lestes eurinus* was about one year. Rapid larval growth occurred from July to mid-October with development being arrested by late October. The

population overwintered in the three stages preceding the ultimate instar. Larval growth was resumed in March and progressed rapidly until emergence. Emergence began on May 1, was rather unsynchronized, lasted for two months, and was temperature-dependent. Oviposition occurred during June and July; the females were observed to oviposit only in the abundant emergent bur-reed *Sparganium americanum*. Eclosion occurred from mid-July until mid-August. The larvae grew rapidly in the succeeding months and attained the overwintering stages by October. Approximate average durations of the various stages in the life-history were: egg, 6.5 weeks; larva, 35 weeks; and adult, 6.5 weeks. (Support by Grant GB-3654 from the National Science Foundation.)

(75)

Niche Differentiation Between Two Closely Related Species

J. FRANK MCCORMICK, LEOLA CROSTHWAITE, CAROL DAMON, WESLEY EGAN, JOHN FINDLEY, VIOLET A. HICKS, RICHARD LEONARD AND WILBUR H. RITTENHOUSE, University of North Carolina

Sedum pusillum and *Sedum smallii* are endemic to rock outcrops of the Southeastern United States. Although their habitats may be less than one meter apart their distributions on an outcrop do not overlap unless the environment is severely disturbed. Each species occupies a distinct ecological niche. In order to identify the factors which influence niche differentiation population samples of both species were grown under a variety of controlled environments and reciprocal transplants were made on two granite outcrops. Reduced phenotypic variability in controlled environments caused the nearly identical species to appear even more similar than in the field. Experimental results indicate that niche differentiation is based upon differential tolerances to combinations of temperature, competition, frequency and amount of moisture and soil depth. Although light intensity does vary significantly between the two habitats, and light intensity does influence pigmentation of both species, it does not appear to significantly influence niche differentiation. Except for responses to light intensity and soil pH, differences in species physiological tolerances can be correlated with differences in the micro-environment of each species.

(127)

Serological Identity of the Mammalian Lethal Components of the Venoms of *Latrodectus mactans* and *L. variolus*

JOHN D. MCCRONE, University of Florida
ROBERT J. HATALA, Florida Presbyterian College

A protein fraction, lethal to mammals, was isolated from the venom of the Southern black widow *Latrodectus mactans* by means of vertical acrylamide gel electrophoresis. An antiserum against this lethal fraction was prepared by injecting a rabbit with homogenized acrylamide gel containing the fraction. A volume of 0.25 ml of the antiserum protected mice against the lethal effects of 5 LD₅₀'s of the venoms of *L. mactans* and the Northern black widow *L. variolus*. The antiserum also produced two major precipitation lines when reacted with each venom in double immunodiffusion tests.

(100)

The Fertilizability of Eggs of *Triturus viridescens* Taken from Different Levels of the Oviduct

ELLEN W. McLAUGHLIN, Emory University

The oviduct of this species is divided into five recognizable regions designated A through E from anterior to posterior. Each region secretes a distinct jelly coat around the egg, these being designated J1 through J5 from inner to outer (Humphries, A., Devel. Biol. 13: 214, 1966). In order to investigate the relative importance of each jelly layer in fertilization, eggs from the five regions as well as from the body cavity were artificially inseminated with an undiluted sperm suspension from the vas deferens. The following percentages of fertilized eggs were obtained: body cavity, 1% (1/68); region A, 20% (14/71); region B, 51% (24/47); region C, 63% (52/83); region D, 86% (50/58) and region E, 69% (250/360). The fertilizability of eggs increased with the addition of jelly layers through region D, but eggs from region E showed a somewhat lower percentage of fertilization than those from region D. Cytological examination of inseminated eggs from regions D and E revealed that spermatozoa placed directly on the J4 surface entered the jelly layers in greater numbers than those placed on the J5 layer. This suggests that the physical and/or chemical properties of the J4 layer may be more conducive to fertilization or that the J5 jelly coat acts as a partial barrier to sperm penetration. (Supported by grant GM 09878 from the United States Public Health Service.)

(76)

The Effects of Ionizing Radiation on the Growth of Old-field Species

GARY L. MILLER, University of North Carolina

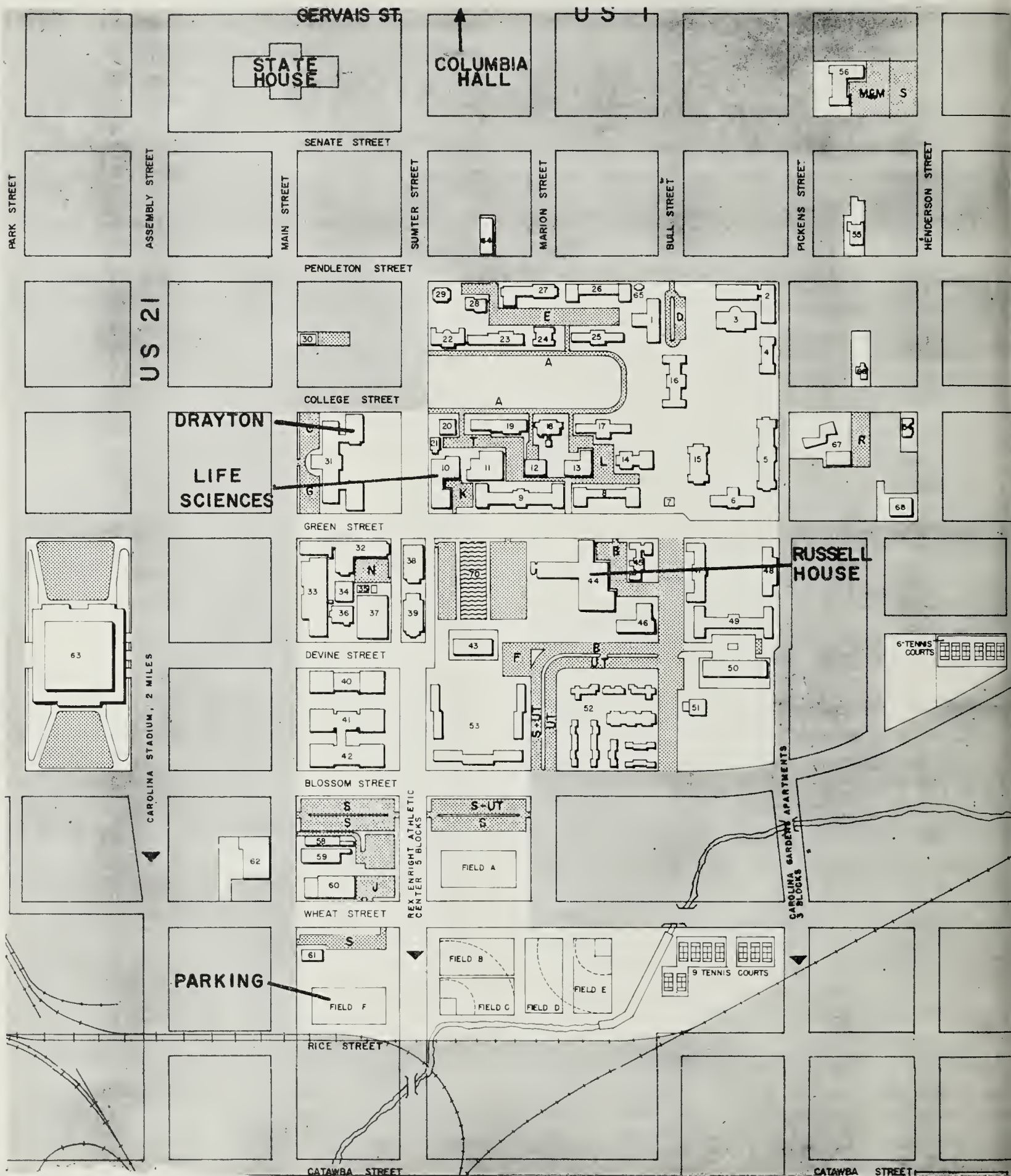
Four sections of a 12 year old-field were seasonally irradiated (April, July, October, January) for twenty-nine days using a portable 9200 curie source. Naturally occurring populations of *Haplopappus divaricatus*, *Eriogon strigosus*, *Cassia fasciculata*, *Andropogon* spp. and *Pinus palustris* were exposed to thirteen gamma radiation levels ranging from 70 r to 210 kr (total dose). Measurements on apical growth, flower, fruit and seed production, germination and dry weight were made. Significant responses in all categories were observed. LD/100's for mature plants ranged from 4.2 kr for *Pinus palustris* to 210 kr for *Haplopappus divaricatus*. It is hoped that these studies, along with others currently going on, will make it possible to predict if the old-field expresses a seasonal radiosensitivity.

(105)

Helminths from Some Wild Mammals in the Southeastern United States

GROVER C. MILLER AND REINARD HARKEMA, North Carolina State University

Studies were conducted on the incidence and distribution of helminths in four species of wild mammals. Sixteen bobcats, twelve from North Carolina and four from South Carolina, contained the following parasites: TREMATODA: 2 species; CESTODA: 4 species; ACANTHOCEPHALA: 1 species; NEMATODA: 7 species. Twenty otters, from North Carolina contained the following: TREMATODA: 2 species. NEMA-



CAMPUS MAP UNIVERSITY OF SOUTH CAROLINA COLUMBIA, SOUTH CAROLINA

1. ADMINISTRATION BUILDING
2. NAVAL R.O.T.C. ARMORY
3. HAMILTON COLLEGE
4. BARNWELL COLLEGE
5. SLOAN COLLEGE
6. LeCONTE COLLEGE
7. PETIGRU COLLEGE
8. MELTON OBSERVATORY
9. SNOWDEN COLLEGE
10. WOODROW COLLEGE
11. BURNETT COLLEGE
12. PRESTON COLLEGE
13. LIFE SCIENCES
14. SCIENCE ANNEX
15. EDUCATIONAL TELEVISION
16. HEATING PLANT
17. SECURITY AND COMMUNICATIONS
18. CURRELL COLLEGE
19. DAVIS COLLEGE
20. McKISSICK LIBRARY
21. RUTLEDGE COLLEGE
22. PRESIDENT'S HOME
23. LEGARE COLLEGE
24. PINCKNEY COLLEGE
25. LIEBER COLLEGE
26. GREEN HOUSE
27. SOUTH CAROLINIANA LIBRARY
28. ELLIOT COLLEGE
29. HARPER COLLEGE
30. McCOTCHEN HOUSE
31. DeSAUSSURE COLLEGE
32. ADMINISTRATION ANNEX
33. THORNWELL COLLEGE
34. COKER COLLEGE
35. MAXCY COLLEGE
36. FLINN HALL
37. WORLD WAR MEMORIAL
38. AUDIOVISUAL AND EXTENSION LIBRARY
39. DRAYTON HALL
40. WARDLAW COLLEGE
41. ENGINEERING, SCHOOL OF
42. PHYSICAL SCIENCES (PLANNED)
43. SHOP
44. STEAM LABORATORY
45. NEUTRON GENERATOR BUILDING
46. FIELD HOUSE
47. GYMNASIUM
48. SWIMMING POOL
49. MEN'S RESIDENCE HALL H-J
50. MEN'S RESIDENCE HALL K-L
51. MEN'S RESIDENCE HALL M-N
52. UNDERGRADUATE LIBRARY
53. RUSSELL HOUSE
54. THOMPSON INFIRMARY
55. BUSINESS ADMINISTRATION, SCHOOL OF
56. McCLINTOCK
57. WADE HAMPTON COLLEGE
58. SIMS COLLEGE
59. SOUTH BUILDING
60. SOUTH TOWER
61. UNIVERSITY TERRACE
62. FRATERNITY ROW
63. TIVOLI APARTMENTS
64. KIRKLAND APARTMENTS
65. McMASTER
66. EAST CAMPUS CENTER
67. MAINTENANCE SHOPS
68. SERVICE CENTER
69. CENTRAL SUPPLY
70. OFFICE BUILDING
71. ADMINISTRATION ANNEX
72. AUDIOVISUAL AND EXTENSION LIBRARY
73. BARNWELL COLLEGE
74. BURNETT COLLEGE
75. BUSINESS ADMINISTRATION, SCHOOL OF
76. CENTRAL SUPPLY
77. COKER COLLEGE
78. CURRELL COLLEGE
79. DAVIS COLLEGE
80. DeSAUSSURE COLLEGE
81. DRAYTON HALL
82. EAST CAMPUS CENTER
83. EDUCATIONAL TELEVISION
84. ELLIOT COLLEGE
85. ENGINEERING, SCHOOL OF
86. FIELD HOUSE
87. FLINN HALL
88. FRATERNITY ROW
89. GREEN HOUSE
90. GYMNASIUM
91. HAMILTON COLLEGE
92. HARPER COLLEGE
93. HEATING PLANT
94. KIRKLAND APARTMENTS
95. LeCONTE COLLEGE
96. LEGARE COLLEGE
97. LIEBER COLLEGE
98. LIFE SCIENCES
99. MAINTENANCE SHOPS
100. MAXCY COLLEGE
101. McCLINTOCK
102. McCOTCHEN HOUSE
103. McKISSICK LIBRARY
104. McMASTER
105. MELTON OBSERVATORY
106. MEN'S RESIDENCE HALL H-J
107. MEN'S RESIDENCE HALL K-L
108. MEN'S RESIDENCE HALL M-N
109. NAVAL R.O.T.C. ARMORY
110. NEUTRON GENERATOR BUILDING
111. OFFICE BUILDING
112. PETIGRU COLLEGE
113. PHYSICAL SCIENCES (PLANNED)
114. PINCKNEY COLLEGE
115. PRESIDENT'S HOME
116. PRESTON COLLEGE
117. RUSSELL HOUSE
118. RUTLEDGE COLLEGE
119. SCIENCE ANNEX
120. SECURITY AND COMMUNICATIONS
121. SERVICE CENTER
122. SHOP
123. SIMS COLLEGE
124. SLOAN COLLEGE
125. SNOWDEN COLLEGE
126. SOUTH BUILDING
127. SOUTH CAROLINIANA LIBRARY
128. SOUTH TOWER
129. STEAM LABORATORY
130. SWIMMING POOL
131. THOMPSON INFIRMARY
132. THORNWELL COLLEGE
133. TIVOLI APARTMENTS
134. UNDERGRADUATE LIBRARY
135. UNIVERSITY TERRACE
136. WADE HAMPTON COLLEGE
137. WARDLAW COLLEGE
138. WOODROW COLLEGE
139. WORLD WAR MEMORIAL

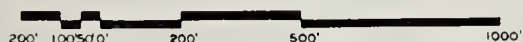
ADDED JULY, 1966

62. WAREHOUSE
63. MEMORIAL HALL (PLANNED)
64. 1321 PENDLETON BUILDING
65. OLD OBSERVATORY — OFFICES
66. 1621 COLLEGE — OFFICES
67. HUMANITIES CENTER (PLANNED)
68. ENERGY FACILITY (PLANNED)
69. CAPSTONE HOUSE (PLANNED)
70. SPRAY POND — PARKING (PLANNED)
69. CAPSTONE HOUSE (PLANNED)
66. 1621 COLLEGE — OFFICES
68. ENERGY FACILITY (PLANNED)
67. HUMANITIES CENTER (PLANNED)
63. MEMORIAL HALL (PLANNED)
65. OLD OBSERVATORY — OFFICES
64. 1321 PENDLETON BUILDING
70. SPRAY POND — PARKING (PLANNED)
62. WAREHOUSE

OTHER UNIVERSITY OF SOUTH CAROLINA FACILITIES

CAROLINA STADIUM (8.0 ACRES) 2 MILES SOUTH ON ASSEMBLY STREET
ENRIGHT ATHLETIC CENTER (22.9 ACRES) 5 BLOCKS SOUTH ON SUMTER
R. G. BELL CAMP (234 ACRES) 14 MILES N.E. OFF STATE ROUTE 12
BELSER ARBORETUM (6.8 ACRES) 2.5 MILES E. ON BLOSSOM, COLEMAN
CAROLINA GARDENS APTS. (4 ACRES) 3 BLOCKS SOUTH ON PICKENS ST
WOODLAND TERRACE (19.4 ACRES) 3.1 MI. E., PICKENS, ROSEWOOD, BELT LINE

LEGEND



TODA: 3 species. Twenty four grey foxes from North Carolina, South Carolina, and Georgia, contained: TREMATODA: 5 species; CESTODA: 3 species; NEMATODA: 7 species. Five red foxes, four from North Carolina and one from Georgia, contained CESTODA: 1 species; NEMATODA: 5 species.

The 65 mammals harbored 28 different species of helminths. The bobcats collected from coastal counties contained more helminths, both in kinds and numbers, than did the otters or foxes. The otters contained the fewest parasites and the foxes, although collected from widely distributed areas, never showed heavy infections.

(50)

Effects of THAM, Glucose, and Hypothermia Upon Tolerance to Asphyxia in Newborn Puppies

JAMES A. MILLER, JR., MICKEY VIA AND FAITH S. MILLER,
Tulane University

Neonatal puppies with body temperatures between 42° C and 5° C were asphyxiated in 95% N₂ + 5% CO₂. Those at 15° C survived over 7 times as long as those in the coenothermic range as measured by Time of Last Gasp (T.L.G.). Spontaneous recoveries were recorded for 100% of 15° animals after 4 times, and 50% recovered from 9X-10X the lethal exposure for warm littermates. During asphyxia, blood glucose, potassium, lactate and hydrogen ions increased and pyruvate decreased. In puppies at 15° all of these changes took place at a slower rate than in warm littermates. In coenothermic animals (37°) controlling pH by infusion of Trishydroxyaminomethane (THAM) increased survival times by 18%, infusion of glucose by 19%, and combining the two by 68%. Cooling to 15° C colonic temperature gave survivals of 655%. Combining THAM and glucose with hypothermia (15° C) gave an average of 1104%. THAM-glucose infusions also permitted recoveries from exposures which were lethal for non-infused animals at the same temperature.

(123)

Endocrine Control of Locomotor Activity in the Crawfish *Faxonella clypeata*

W. C. MOBBERLY, JR., *Northeast Louisiana State College*

Studies were carried out on the movement of *Faxonella clypeata* in a linear maze. Intact crawfish and crawfish with both eyes painted black moved a greater distance in a 15-minute time period than crawfish with both eyestalks ligated or eyestalkless. Animals with the ligation removed showed an increase in movement, but did not obtain the distance achieved prior to ligation. The injection of extracts of eyestalks prepared in van Harreveld's solution produced a decrease in movement in intact animals. The concentrations used ranged from 1/2 to 4 eyestalks per 0.02 ml of extract injected. Higher concentrations produced less movement than at lower. It would appear that the release of a substance or substances from the eyestalk is involved in regulating the intensity of locomotion in this crawfish.

(115)

Multiple Regression Comparisons of Six Abiotic Parameters with the Distributions of Two Species of *Chironomus* (Diptera, Chironomidae) in a Five Hectare Piedmont Lake

SAMUEL C. MOZLEY, *Emory University*

Chironomus plumosus L. and *C. crassicaudatus* Malloch, both in the plumosus supra-specific group, occur sympatricly in polymictic Lullwater Lake near Atlanta, Georgia. Their distributions are overlapping, but maximal densities are in separate areas. Three stratified random samples were conducted and data were taken at 120 sites on larval density and the following environmental parameters: depth, pH, oxygen tension, substratum composition, and water and bottom temperatures. These data were analyzed using a digital computer, the parameters were ranked according to their ability to predict larval density at each site, and a measure of the goodness of fit of predicted to actual values was computed. Results show that depth is the most important parameter, and substratal types show some relationships.

(133)

Biochemical Mechanisms in the Hormonal Control of Sexual Morphogenesis in *Achlya*

J. T. MULLINS AND D. DES S. THOMAS,
University of Florida

The heterothallic species of the genus *Achlya* consist of a linear series of sexual strains each of which, with the exception of the two terminal strains interacts as ♂ or as ♀, depending upon its position in the series relative to that of its mate. The sexual reproductive process is initiated and coordinated throughout its entire course by a series of specific diffusible hormones. The morphological response of ♂ strains to hormone A, which is produced by ♀ strains, is the production of antheridial initials. The production of these ♂ sexual organ primordia depends upon the induction of the enzyme cellulase. This enzyme appears to "soften" the cell wall which then allows the hyphal contents to be flow-oriented in the direction of maximum strain into fingerlike laterals. The peak of cellulase production corresponds in time with the appearance of the antheridial initials. The response to the hormone depends upon protein synthesis. The mechanism of response of ♀ strains to hormone B, which is produced by sexually induced ♂ strains, is similar to that described for ♂ strains.

Norris, William W. — Please see page 28.

(94)

A Wild Yam

HERMAN O'DELL, *East Tennessee State University*

A species of wild yam was observed blooming at El Verde, Puerto Rico during the summer of 1966. Buds were collected and fixed in the field. Slides were prepared from these specimens by the paraffin method. These slides were examined for different morphological stages.

(128)

The Genus *Clavaria* in the Southeastern U. S.

PAUL D. OLEXIA, *University of Tennessee*

The genus *Clavaria* is separated from other members of the Clavariaceae on the basis of hyaline, smooth

spores and the total absence of clamp connections on the medullary hyphae. The genus is divided into two subgenera on the basis of the presence or absence of a bifurcation or wide loop-like clamp connection at the base of the basidium (Holocoryne or Syncoryne respectively). The most common species is *C. vermicularis*, the fruiting bodies of which are shining white fascicles of very brittle clubs generally found in grassy areas. *C. fumosa* is similar to *C. vermicularis* but has a more drab creamy appearance and the tips of the clubs are usually dark brown and withered. *C. rosea* is distinguished from the above species by the fleshy or rosaceous color of the fruiting bodies. *C. purpurea* is similar in form to the above species but is smoky brown or grayish purple and bears large cystidia which are quite evident upon microscopic examination. *C. atrounbrina* is dark brown in color and bears longitudinal ridges on the clubs which are generally individual rather than in fascicles. *C. zellingeri* is relatively easily distinguished from all of the above by its coralloid habit of growth and bright purple coloration. All of the above species belong to the subgenus Syncoryne.

C. incarnata is a member of the subgenus Holocoryne and only has been collected three or four times in North America — twice in the southeast. These clubs are solitary and pale pink with a readily distinguishable stipe. *C. acuta*, although its southern-most extension thus far is southern Ohio, probably occurs further south but has not yet been reported. It also bears the proximal bifurcation of the basidium and occurs as solitary or fasciculate clubs on bare soil.

(45)

Differential Reactivity of Urodele Developmental Chromosomes

ROSALYN M. PATTERSON AND ERNEST L. HUNT,
Emory University

Investigations have been conducted to determine the reaction of Urodele chromosomes to low temperature during early embryological stages. Embryonic stages of *Ambystoma punctatum* and *Triturus viridescens* were maintained at 1° C for four days. Control stages were kept at 12° C and at room temperature. The embryos were stained with aceto-orcin and by the Feulgen method. Metaphase chromosomes with cold reactive segments were observed in all experimentally treated embryos. Chromosomes from control embryos did not show such segmented areas. These differentially reactive segments are considered to represent the heterochromatic regions of the chromosomes. Experimental embryos treated with relatively high amounts of colchicine demonstrated a reduction or absence of segmentation of the chromosomes. This may indicate that the differentially reactive chromosomal areas are underspiralized rather than deficient in deoxyribonucleic acid.

(87)

Plant Ecology in the Education of Pre-Medical Biology Undergraduates

E. GIBBES PATTON, *Wofford College*

The core of biology courses required for biology majors in Wofford College includes a fall-and-winter semester of ecology taught by a plant ecologist. The majority of the 20-25 students taking the course are pre-medical. Two features of the laboratory-centered course have demonstrated special value during the past 3 years:

1. Intensive descriptions of phenology and physical-environmental variables in distinct, contiguous plant communities. Continuing and comparative study by each work-group culminates in a report on its community.

2. Investigation of a local problem in applied ecology—definition of a separate problem by each work-group and ecological analysis of the current solution. The work-group teaches the “lesson” and arranges the field trip.

Objectives and results will be discussed. Sample course materials are available.

(39)

Effects of Dimethyl Sulfoxide and Naphthaleneacetic Acid on Radiosensitivity of Cultured *Cucurbita* calluses

ROBERT A. PEDIGO, *The College of William and Mary*

Summer Squash tissue was grown on media modified with various concentrations of naphthaleneacetic acid (NAA) both with and without dimethyl sulfoxide (DMSO). Exposure of the calluses to 10,400 r of gamma radiation resulted in a decrease in growth associated with increasing NAA concentration. When DMSO was present with the NAA, increasing growth with increasing NAA concentration was found, indicating that DMSO may have been involved in the repair of radiation damage to the cell membrane. Detrimental effects of increased cell wall plasticity caused by the NAA may also be involved in radiosensitivity.

(129)

The Genus *Clavulina* (Fungi, Clavariaceae) in the Southeastern United States

RONALD H. PETERSEN, *University of Tennessee*

The genus *Clavulina* is separated from other genera of clavarioid fungi by its stichic, bi-spored, usually secondarily septate basidia. In the southeastern United States, *Clavulina* is represented by no less than nine species, one of which has remained undescribed. Undoubtedly the most common taxonomic unit in this geographical region is a complex of four taxa, usually referred to as *C. cristata*, *C. rugosa*, *C. cinerea* and *C. amethystinoides*. No adequate taxonomic characteristics have been investigated which satisfactorily separate these, and evidence has been presented which indicates that the complex represents a non-speciated evolving gene pool in which most combinations of taxonomic characters are still being exhibited. One undescribed species, belonging to the subgenus *Fusco-clavulina*, is illustrated for the first time.

(85)

Parasitism and Host Range of *Nestronia umbellula* Raf. (Santalaceae)

MARTIN A. PIEHL, *University of Wisconsin*

Nestronia, a monotypic, rhizomatous shrub, was studied at several stations in Georgia and South Carolina where it often occurred within or at margins of pine-hardwood stands. *Nestronia* is a root hemiparasite which produces haustorial connections to underground parts of neighboring plants. Though its haustoria may have the typical bulb-like shape, they are very often strongly clasping, and are comparatively large, although they range from ca. 1 to 15 mm. across. They are un-

usual because of their reddish-brown surface and conspicuous concentric lines or low ridges. The literature has long stated the hosts are deciduous trees and shrubs, and recently pine was added. However, detailed study has disclosed haustorial attachments to a variety of plants from 23 families, ranging from ferns and self-parasitism to angiospermous and gymnospermous trees; shrubs; monocots; several herbaceous dicots, especially perennials, and another hemiparasite, *Aureolaria*. Though attachments are made to many species, they were not equally successful, but tended to be more vigorous and numerous on certain woody species and herbaceous dicots. (Research aided by NSF G-22079 made to the Highlands Biological Station.)

(86)

Root Grafts and Haustorial Self-parasitism in *Aureolaria* (Scrophulariaceae)

MARTIN A. PIEHL, *University of Wisconsin*

Studies of root parasitism in *Aureolaria*, subg. *Eu-aureolaria*, have demonstrated a remarkably high frequency of self-parasitism. Particularly in *A. laevigata* and *A. flava*, attachments between roots of an individual plant (or of nearby plants) existed not only as the usual bulb-shaped haustoria, but also as simple fusion of roots in close proximity, i.e., root grafts. Though grafts are not uncommon in larger roots, especially near the crown, in various plants, they often involved small roots and occurred over much of the diffuse root system in *Aureolaria*. Most unusual was the abundance of haustorial connections and grafts, resulting in a greatly fused root system of repeatedly anastomosing members. In both types of connections the union of outer tissue was quite complete and continuity of vascular tissue occurred inwardly. The function and adaptive value of self-parasitism in various parasites is generally open to speculation, and an added question in *Aureolaria* concerns the possibility that these plants show root parasitism in primitive (grafts) and more advanced stages (haustoria).

(134)

Accumulation of Radioisotopes in Certain Lichens

G. L. PLUMMER, *University of Georgia*

Concentration values for 9 radioisotopes are shown for 3 lichens. The lichens are similar to those involved in food chains of Alaskan caribou and leading to eskimos. *Parmelia conspersa* probably contains more radionuclides than any other plant in Georgia whereas two species of *Cladonia* generally held 0.1 the radionuclides relative to biomass; but, when density of those lichens is considered, *Cladonia* with more biomass contained more ^{137}Cs . Treatments with as much as 500 nCi/m² of ^{134}Cs produced no significant loss of radiocesium after lichens were leached with heavy rainfall. The results suggest that the capacity for species of *Cladonia* and *Parmelia* to accumulate ^{137}Cs is rather unlimited for a while. Accumulation is expected to increase as long as radioactive fallout increases and concentrations relative to biomass shall increase likewise. An “equilibrium” may be expected only if the rate of incoming ^{137}Cs ever equals the rate of radioactive decay. Lichens hold very small amounts of ^{90}Sr probably because the component fungus has very low calcium requirements. Data will show results of monitoring for the past 5 years.

(102)

A New Host Record for *Cepedietta*
(= *Haptophrya*) *michiganensis* (Woodhead),
1928 (Protozoa: Ciliata)

VERNON N. POWDERS, *The University of Tennessee*

The astomatous ciliate, *Cepedietta michiganensis*, has been reported in: *Hemidactylium scutatum*, *Plethodon cinereus*, *P. glutinosus*, *Ambystoma jeffersonianum*, *A. opacum*, *Desmognathus fuscus*, *D. phoca*, *Eurycea bislineata*, *E. longicauda*, *Pseudotriton montanus* and *Rana sylvatica*. *Cepedietta michiganensis* was first observed on May 29, 1966, in *Plethodon jordani* collected in the Great Smoky Mountains National Park. During the periods of April 30 to June 24 and August 29 to September 30, 1966, 641 specimens of *P. jordani* were collected in the GSMNP. *Cepedietta michiganensis* was found in 8.6% of the salamanders examined.

(106)

Altitudinal Distribution of *Cepedietta*
(= *Haptophrya*) *michiganensis* (Woodhead),
1928 (Protozoa: Ciliata)

VERNON N. POWDERS, *University of Tennessee*

Infectivity of *Plethodon jordani* and *P. glutinosus* by the astomatous ciliate, *Cepedietta michiganensis*, was studied in specimens collected in the Great Smoky Mountains National Park between August 24 and September 30, 1966. Specimens of *P. glutinosus* were also examined during this period from Knox County, Tennessee. *P. glutinosus* and *P. jordani* were collected at altitudes between 2700 and 4600 feet. *P. jordani* was also collected above 4600 feet. *P. jordani* was not collected below 2700 feet and *P. glutinosus* was not collected above 4600 feet.

Of 61 specimens of *P. glutinosus* from Knox County, Tennessee, 82% were infected. Of 95 specimens of *P. jordani* from altitudes above 4600 feet in the GSMNP, none were found infected. The statistical analysis of the *P. jordani* and *P. glutinosus* data obtained from 2700 to 4600 feet suggests that the infectivity is inversely proportional to altitude, that the decreases in infectivity in both salamander species are equal and that there is no difference in infectivity between the two species. The above data would suggest that some factor, possibly controlled by altitude, plays a reducing and/or limiting role in the vertical distribution of *Cepedietta michiganensis*.

(103)

The Proposed Role of Parasites as Indicators
of Host Ancestry

CHARLES E. PRICE, *North Texas State University*, AND
PETER S. MAITLAND, *The University, Glasgow, Scotland*

The present authors are currently engaged in a joint study concerning host-parasite relationships of the fishes of Great Britain and their Monogenea. During one phase of the study, we have found reason to believe that in certain cases, gill trematodes can furnish parasitological evidence of host ancestry. The cosmopolitan monogenetic trematode *Discocotyle sagittata* (Leuckart, 1842) was recovered from the gills of two *Coregonus* species, one from Lynn Tegid, North Wales, the other from Loch Lomond, Scotland. *Discocotyle* has apparently evolved from a mazocraeidean-like marine progenitor. As the British whitefish hosts have been land-locked for a mini-

um period of 15,000 years, their harboring of *Discocotyle* strongly suggests that *Coregonus* evolved from marine ancestors. Other factors are cited.

D. sagittata was comparatively studied, with the resultant opinion that *Discocotyle* is in actuality a monotypic genus.

(11)

Progress Toward Production of a Flora of
Mississippi

THOMAS M. PULLEN, *University of Mississippi*

Components of the vascular flora of the entire southeastern region of the United States are not adequately known. This is especially true of the area embraced by Mississippi. This 47,716 square mile area of the Mississippi embayment has doubtless played an important role in speciation as elements of western and eastern refugia have come together. Thorough knowledge of this flora is paramount for a better understanding of phytogeographical and evolutionary problems in the Southeast. In 1963 a project, supported by the Committee on Faculty Research, was initiated to study the vascular plants of this area. In January, 1966 the National Science Foundation provided funds which enabled Samuel B. Jones from the University of Southern Mississippi and J. Ray Watson of Mississippi State University to join me as associates in this study. Many new state records have been recorded and some distribution gaps have been filled.

(4)

A Biosystematic Study of the Genus *Cimicifuga*
(Ranunculaceae), with Emphasis on
Cimicifuga rubifolia Kearney

GWYNN W. RAMSEY, *Lynchburg College*

A biosystematic study of the genus *Cimicifuga* has been made on a world-wide basis. Herbarium specimens of all species and field populations of all North American species have been studied in an attempt to distinguish the biotypes within the genus. Comparisons between the North American and Eurasian species have been made by using several techniques which utilize taxonomic, phytogeographic, ecologic, biometric, and gross morphologic data.

Recent investigations show that *Cimicifuga cordifolia* Pursh and *Cimicifuga racemosa* (L.) Nutt. var. *cordifolia* (Pursh) Gray have not been well understood. They have been confused with *C. rubifolia*. *C. cordifolia* Pursh appears to be a biotype of *C. americana* Michx. and *C. rubifolia* is a distinct species. The distribution of *C. rubifolia* has been extended beyond its previously published range.

(97)

An Experimental and EM Analysis of the
Origin of Langerhans Cells

W. M. REAMS, JR., *Medical College of Virginia and
University of Richmond*,

R. B. SCOGGINS, *Medical College of Virginia*, AND
A. S. ZELICKSON, *University of Minnesota Medical School*

Since described by Langerhans in 1868, the gold-positive dendritic cells of the suprabasal layers of the epidermis have challenged skin researchers. Thus far, only circumstantial evidence has been available on the possi-

ble origin and function of the cells of Langerhans. In the present investigation, skin from embryo PET mice, prior to invasion of neural crest cells, was grafted into the coelom of chick embryo hosts and allowed to mature to the equivalent age of a 3-day post partum mouse. The neural crest-free grafts were examined with the electron microscope for the occurrence of Langerhans cells, and cells of known neural crest origin — melanocytes. Since neither Langerhans cells nor melanocytes have been seen with the EM in this neural crest-free skin, it is tentatively suggested that Langerhans cells, like melanocytes, are of neural crest origin in the PET mouse. (Supported by NIH grant ITI AM 5508-01.)

(89)

Comparative Megasporogenesis in Leguminosae, Subfamily Caesalpinoideae

DAVID H. REMBERT, JR., *University of Kentucky*

The present investigation concerns four species: *Cercis canadensis* L., *Cassia abbreviata* Oliv. var. *grauitica*, *Cassia nictitans* L., and *Gleditsia triacanthos* L. In *Cercis canadensis* the archesporium is subhypodermal and may consist of one or two cells. A single hypodermal archesporial cell develops in the other three species. The hypodermal archesporial cell in the *Cassia* species and in *G. triacanthos* divides periclinally to form a parietal cell and a primary sporogenous cell. Parietal cell divisions contribute to the nucleolar mass as the sporogenous cell enlarges to form the megasporocyte. In *Cercis canadensis* the megasporocyte is formed by direct enlargement of the archesporial cell. Meiosis occurs in all species to form a tetrad of megaspores. Frequently, the micropylar dyad member in *Cassia nictitans* fails to undergo the second meiotic division. While only the chalazal megaspore functions in megagametogenesis, there is a tendency for the third megaspore to persist in all species. On one occasion two linear tetrads were observed in an ovule of *G. triacanthos*.

(82)

Distribution of *Tsuga canadensis* (L.) Carr. and *T. caroliniana* Engelm. Along Cascades Creek in the Vicinity of Hanging Rock State Park, Danbury, North Carolina

HOLLIS J. ROGERS, *University of North Carolina at Greensboro*

JOHN D. BARNETT, *Superintendent, Hanging Rock State Park*

Moore's Knob, a monadnock in the upper piedmont of Stokes County North Carolina is drained primarily by Cascades Creek. This stream originates along the crest of Moore's Knob, Moore's Wall and Cooks Wall at elevations up to 2579 feet. It forms a spiral around Moore's Knob for some five and one half miles to join the Dan River at Moore's Springs, elevation 730 feet.

Tsuga caroliniana Engelm. is distributed on the upper drainage of this stream for some three and one half miles but terminates at the Lower Cascades, elevation 1,000 to 900 feet. *Tsuga canadensis* (L.) Carr. occurs with the Carolina Hemlock in the gorge at the Lower Cascades and along the remaining two miles of the stream.

Soil conditions and not elevation is believed to be responsible for the segregation of these two species along Cascades Creek. Carolina Hemlock occupies the rocky

cliffs, talus slopes and outcrops in the upper area while the Canadian Hemlock is found on the deeper alluvial soils as the stream reaches the floodplains near the Dan River.

Some species associated with Carolina Hemlock in this area are *Pinus rigida* Mill., *Betula lenta* L., and *Saxifraga michauxii* Britton. Associated with the Canadian Hemlock on the better soils are *Pinus strobus* L., *Betula nigra* L. and *Saxifraga virginensis* Michx.

(107)

Nucleoside Polyphosphatase Activity in Helminths

STEFFEN ROGERS AND BURTON J. BOGITSH, *Vanderbilt University*

Nucleoside polyphosphatase activity was investigated in the glands of *Schistosoma mansoni* cercariae, *Hymenolepis diminuta* oncospheres, and *Posthodiplostomum minimum* metacercariae and adults. Cryostat sectioned material was incubated in a modified Gomori calcium-cobalt substrate in which one of several nucleoside polyphosphates was included. The action of inhibitors and activators was demonstrated by the addition to the basic substrate of either BAL, L-cysteine, PCMB, actinomycin-D, various cations, or spermine. The enzyme demonstrated is sulfhydryl-independent, is activated by magnesium cations, and hydrolyzes a wide variety of nucleoside triphosphates. Unlike adenosine triphosphatase found in the muscle, it is not inhibited by lead or PCMB. The physiological role of the enzyme will be discussed.

(43)

Cell Population Dynamics in Irradiated Ehrlich Ascites Carcinoma

W. ST. AMAND, *University of Mississippi*

Ehrlich ascites tumor cell populations irradiated *in vivo* in the mouse show a dose related increase in average cell size. After doses of X-rays large enough to reduce mitotic index to zero but before massive cell death occurs population shifts can be followed for cells in three series of size classes. The pattern of response is an increase in the number of cells in larger volume classes concomitant with a decrease of cell frequency in classes of unit volume. Differences in rate of response of cells of different volumes suggest that radiation will be a useful tool in the understanding of cell interrelationships in this heterogeneous cell population.

(95)

Histological Changes Induced in Nodal Traces and Petioles of *Ulmus americana* by Culture Filtrates of *Ceratocystis ulmi*

ARMSTEAD L. SALTERS AND LAFAYETTE FREDERICK, *Atlanta University*

Observations have been made on histological changes induced in nodal and petiolar traces of cuttings of *Ulmus americana* by culture filtrates of isolates of *Ceratocystis ulmi*. Extensive vessel wall discoloration, distortion and collapse, discoloration of associated parenchyma cells and tylose formation, vascular dysfunction, erosion of inner surface of vessel walls, and conspicuous occluding of vessel lumina have been noted. Progressive development of these histological changes have been followed and correlated with length of exposure to culture filtrates

and severity of expression of disease symptoms. The extent of vessel lumen area occluded and percentage of occluded vessels in nodal and petiolar traces has been determined. Partial vessel lumen occlusion was found 6 hr after culture filtrate exposure. Complete occlusion of lumina of the majority of vessels in nodal traces and petioles was found 48 hr after exposure. These findings suggest that vessel occlusion in nodal traces and petioles may be primarily responsible for leaf wilt in Dutch elm disease.

(18)

Reproduction in the Southern Studfish, *Fundulus stellifer* (Jordan)

JAMES D. SATTERFIELD, *Georgia State College*

At latitude 34° N in Georgia and Alabama, *Fundulus stellifer* spawns in early spring when water temperatures approach 19° C and continues to spawn into late summer. Spawning usually occurs at the head of riffles in water 5-15 cm deep with surface currents of 10-40 cm/sec. Nests are not constructed. Definite territories are not defended although a male will chase other males away from the vicinity of a female and may be antagonistic toward other species. Eggs are apparently deposited singly in the fine sand bottom. Eggs average 3.1 mm in diameter. Sand grains adhere to filaments on the chorion. At 22° C, eggs hatch in about 19 days. Hatchlings average 7.0 mm in "standard length". The young move to the margins of the streams and are not vulnerable to predation by larger fish. Studfish developing from eggs laid early in the spring probably spawn late in the summer of the following year.

(79)

Seedling Response of Four Dune Grasses to Varying Levels of NaCl

ERNEST D. SENECA, *North Carolina State University*

Salinity experiments employing the use of modified soxhlet-type automatic sand cultures were conducted on seedlings of four dune grasses: *Ammophila breviligulata* Fern., *Panicum amarulum* Hitchc. & Chase., *Spartina patens* (Ait.) Muhl. and *Uniola paniculata* L. Results will be presented based on wet weight data at the end of a twenty-eight day experimental period. The weight data reveal a primarily linear effect, with decreasing weights corresponding with increasing salinity levels, for *A. breviligulata*, *S. patens* and *U. paniculata*. The response to NaCl by *P. amarulum* is more curvilinear than that exhibited by the other species.

(108)

Autoradiographic and Histochemical Studies of Iron Metabolism in *Haematoloechus Medioplexus*

W. ALLEN SHANNON, *Vanderbilt University*

Iron⁵⁹ and iron⁵⁵ isotopes are used in an autoradiographic study, in conjunction with ordinary histochemical methods, to determine the fate of excess iron ingested by *Haematoloechus medioplexus*.

Specimens have been prepared for paraffin-embedding by formalin-fixation and alcohol dehydration, or by freeze-drying, or by freeze-substitution methods. Stripping film and liquid emulsion techniques are utilized. Observations of the autoradiographed slides are made under light and phase contrast microscopes. (Supported,

in part, by National Science Foundation Grant GB-4742.)

(137)

Growth and Survival of Water Microorganisms in Low Nutrient Level Media

J. MILES SHARPLEY, *Sharpley Laboratories, Inc.*

It has been adequately demonstrated by the author and others that customary laboratory media often support poor growth of the normal bacterial flora in water. The genera *Pseudomonas*, *Achromobacter* and *Micrococcus* are commonly isolated from river water when conventional peptone media are employed. When low nutrient level media (LNLM) are used, *Achromobacter* strains predominate and few micrococci are observed. *Pseudomonads* are frequent but the species are often different.

It became of interest to determine whether isolates recovered on conventional media could support growth in an environment simulating the nutrient levels found in streams. Three cultures identified as *Pseudomonas*, *Achromobacter* and *Micrococcus* species were isolated from river water cultured in conventional media and LNLM. Based on the available data, it appears that conventional media fail to recover a significant portion of the water microflora. In addition, such media may be biased to the recovery of non-significant adventitious microorganisms.

(3)

Generic Position of *Campanula americana* L.

STANWYN G. SHETLER, *Smithsonian Institution*

AND

JAMES F. MATTHEWS, *Charlotte College*

The tall bellflower, *Campanula americana* L., is widely distributed in eastern North America, where it is endemic. In habit and floral morphology it is a very characteristic member of the genus *Campanula*, and Small placed it in the monotypic genus *Campanulastrum*. Recent cytological and palynological studies add weight to Small's opinion. The authors present new evidence for recognizing *Campanulastrum* and evaluate this evidence in the broader context of generic limits in the Campanulaceae as a whole. They discuss the great diversity of *Campanula*, which includes perhaps 300 species, and stress the hazards of isolating segregate genera without a thorough knowledge of the whole group.

(88)

Limnetic Carbon Assimilation in Two Virginia Reservoirs

GEORGE M. SIMMONS, JR., *Virginia Polytechnic Institute*

Reservoirs increase in biological productivity soon after impoundment. A decline in productivity usually follows after 5-6 years. Initial high fish yields have led to the inference that carbon assimilation by the phytoplankton would be comparable.

The carbon assimilation rates of the phytoplankton in two reservoirs have been investigated by means of the Carbon-14, light and dark bottle technique. The two reservoirs studied were the 26 year old Claytor Lake Reservoir on the New River in Pulaski Co., Virginia, and 3 year old Smith Mountain Reservoir on the Roanoke River in Franklin Co., Virginia.

Results show that assimilation rates are consistently higher in Claytor Lake than in Smith Mountain. Preliminary conclusions attribute the differences to a higher and more diversified phytoplankton population in Claytor Lake.

(55)

A Method for Investigation of Aldosterone and Corticosterone in *Rana catesbeiana* Plasma

JANE SINE AND C. N. BOEHMS, *Austin Peay State College*,
AND D. ISLAND, *Vanderbilt University Medical School*

A double isotope dilution method for the determination of aldosterone and corticosterone in *R. catesbeiana* plasma is described. Solvent partitioning was used to divide the sample into two fractions (Fraction I and Fraction II). To Fraction I, a known amount of D-aldosterone-1,2- H^3 was added and the compound was acetylated with acetic anhydride- C^{14} . Conversion from monoacetate to diacetate and back to monoacetate form was instrumental in purification procedures. Purification was accomplished by a series of paper chromatographic isolations. Radioactivity counts were made on the purified sample to quantitatively measure steroid concentration. A known quantity of corticosterone- H^3 was added to Fraction II. Acetylation was performed by addition of pyridine and acetic anhydride- C^{14} . Paper chromatographic purification prepared the sample for radioactivity determinations. By this method it was possible to accurately determine *in vivo* steroid concentrations of less than one microgram per 100 milliliters of plasma. Both free aldosterone and free corticosterone were shown to be present in measurable quantities in the plasma of *R. catesbeiana*.

(21)

A. Allele Necessary for Dilute Coat Color in Horses

W. RALPH SINGLETON, *University of Virginia*, AND
ENRIQUETA CARTER BOND, *former graduate student*,
University of Virginia

A dilution gene in horses in the heterozygous condition converts a chestnut color to a palomino color. Likewise the same dilution gene changes a bay to a dun or buckskin color. The dilution gene c^{er} when homozygous results in an animal almost white, a cremello if b/b , a perlino if $B/-$. Recent evidence shows that the dominant allele of the pattern gene A must be present for any dilution to occur. Two matings of a sorrel mare a/a b/b C/C to a perlino stallion produced two dark brown fillies showing no dilution. One of these mares, when bred to a Palomino $A/-$ b/b C/c^{er} produced a perlino foal with light, almost white, color and blue eyes characteristic of a perlino, demonstrating conclusively that the mother was heterozygous for the dilution gene, but showing no evidence of it, a complete lack of penetrance of the C^{er} dilution allele in the absence of A .

(14)

Reliability of the Mark-release Technique of Estimating Numbers of Mice

MICHAEL H. SMITH, *University of Georgia*

The number of mice of two species, *Mus musculus* and *Peromyscus polionotus*, on an abandoned peanut field was determined by live-trapping using the mark-

release technique and also by capturing the mice while digging out their burrows. The two sampling methods gave results which were significantly different. Available evidence suggests the latter technique revealed the exact structure of the population, while the mark-release method overestimated the *M. musculus* male population and underestimated the *P. polionotus* female population. Males of both species were more readily trapped than females, especially when the females were pregnant or lactating or both. These results are best interpreted in terms of the relative amount of movement shown by the different types of mice. Greater movement increases the likelihood of encountering a trap, and multiple encounters may increase the probability of the mouse entering the trap.

(126)

The Free Amino Acid Composition and Certain Aspects of the Metabolic Fate of Carbon-14 Labeled Alpha Alanine and Aspartic Acid in the Aging Female Mosquito, *Aedes aegypti* (L.)

JAMES D. STIDHAM AND JAMES N. LILES,
The University of Tennessee

The free amino acids of the adult female mosquito, *Aedes aegypti* (L.), were investigated at seven different ages in mosquitoes maintained on two different dietary regimens (sucrose, and sucrose and blood). In addition, certain aspects of the metabolic fate of carbon-14 labeled alpha alanine and aspartic acid were studied. The qualitative and quantitative determination of free amino acids of adult mosquitoes was performed by ion-exchange chromatography (Technicon Auto Analyzer). Twenty free amino acids were consistently present in mosquitoes from both diet groups. However, blood fed insects had higher quantities of amino acids than did those fed sucrose alone, and the acids varied quantitatively with the age of the mosquitoes. Carbon-14 labeled compounds were given in sucrose solution to adult female mosquitoes. Three tissue fractions were analyzed for radioactivity: amino acid extract, lipid fraction and protein fraction. Production of carbon-14 labeled CO_2 was measured as well as radioactivity in the excreta from mosquitoes given carbon-14 labeled compounds. Amount of radioactivity in each case was measured by liquid scintillation counting. The significance of free hemolymph amino acids and the radioactivity of the three tissue fractions will be discussed.

(37)

Probability Values for Chromatid Aberrations

P. L. STRICKLAND AND J. W. DRANE, *Emory University*

X-ray induced chromatid aberrations in *Tradescantia* microspores occur independently in Poisson distributions. Historically, the standard deviation of the mean has been accepted as an indication of the significance limits applicable to a given mean value. A test with equal or greater sensitivity in detecting differences and in this case much simpler to calculate is the Likelihood Ratio Chi-square. It is derived using only the sample size and mean which is the Maximum Likelihood Estimate of the Poisson parameter. Let m_1 equal the mean of one experiment and N_1 , the sample size; m_2 , the mean of a second experiment and N_2 , its sample size; and m , an average of the two means with N the total sample. Assuming the null hypothesis, $m_1 = m_2$, we obtain the

probability that these experiments represent the same population using the equation, $X^2 = 2(-N_m \log m_1 + N_1 m_1 \log m_1 + N_2 m_2 \log m_2)$, where chi square has one degree of freedom and logs are to the base e. (Research supported by the U. S. Atomic Energy Commission under contract number AT-(40-1)-2669 and U.S.P.H.S. Grant 1 SO1 FR-05064.)

(112)

Ecology of Two Populations of an Aquatic Isopod, *Lirceus fontinalis* Raf.

CLARENCE E. STYRON, *Emory University*

An ecological study of the aquatic isopod, *Lirceus fontinalis* Rafinesque, from the weather pool and intermittent creek population on Mount Arabia and the spring population from the Emory University Lullwater Biological Field Laboratory has been approached through (1) investigation of the biological interactions between the isopods and various environmental stresses, (2) investigation of their behavior patterns, and (3) an attempt to determine the factors or combinations of factors which control the maintenance, growth, and movement of the populations which are in two river drainages. Behavior patterns and physiological responses were observed under natural conditions and then tested experimentally in the field and/or laboratory. In addition to the behavioral and physiological comparisons, chromatographic and morphological comparisons of these populations have been made to establish their taxonomic affinities.

(91)

Some Embryological Features of Taxonomic Significance in the Genus *Nyssa* L.

S. R. TANDON AND J. M. HERR, JR.,
University of South Carolina

Several structural and developmental features of the ovule and megagametophyte in three species of *Nyssa* L., *N. sylvatica* Marsh., *N. biflora* Walt. and *N. aquatica* L., provide support for the recognition of Nyssaceae as a family separate from Cornaceae. Additional evidence clearly establishes *N. biflora* as a separate species rather than a variety of *N. sylvatica*. Although points of similarity appear between any two of the three species, greater similarity exists between *N. biflora* and *N. aquatica* than between either species and *N. sylvatica*. The major points of similarity are the presence of a nucellar beak, the shape of the megasporocyte and functional megaspore, the occasional occurrence of bisporic development, and the growth pattern of the chalazal nucellus and the developing megagametophyte.

(40)

Nuclear Characteristics of *Populus deltoides* Clones

F. G. TAYLOR, JR., *Oak Ridge National Laboratory*

Resistance or sensitivity to ionizing radiation in higher plants is correlated with the average interphase nuclear or chromosome volumes of shoot apical meristem cells. Differences in volume and radiosensitivity between genera and species have been well documented. However, little is known concerning possible nuclear differences within a species due to genotypic variability. Apical meristems from 30 clones of *Populus deltoides* Marsh., representing ecotypes from 8 different states, were stud-

ied histologically to determine if any differences in nuclear characteristics existed. Average chromosome volumes of diploid nuclei ranged from $2.38\mu^3 \pm 0.07SE$ in a clone of Alabama origin to 4.24 ± 0.16 in a clone of Wisconsin origin. Phenotypic characteristics such as breaking of dormancy (leafing out), development of secondary stems, and leaf fall were noted. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(28)

Red, Far-Red Light Effect on Pollen Tube Elongation and Pollen Germination in *Tradescantia*

TE-HSIU MA, *Smithsonian Institution*

Mature pollen of *Tradescantia paludosa* desiccated in dark for $\frac{1}{2}$ hour or 24 hours, were treated with red ($660m\mu$) or far-red ($730m\mu$) at the intensity of 850 erg/sec cm^2 for 15 minutes. Treated and control pollen were immediately sown on lactose-agar medium coated slides and grown in a moist chamber for 3, 4 or 6 hours in dark. Tube length measurement using an ocular micrometer and a reticle were made on fixed and stained pollen tubes selected at random from each of the treated and control groups. The results of three separate experiments showed the higher rate of elongation and germination in treated groups than the control groups. Far-red light treated pollen had the higher rate of elongation and germination than those treated with red light. Speculations on the presence of phytochrome or other growth regulating pigment in the pollen will be discussed. (Research sponsored by the U. S. Atomic Energy Commission under Contract No. AT(30-1)2373.)

(13)

A Preliminary Survey of the Flora of Several Southwestern Virginia Piedmont Counties

WAYNE THACKER, WILLIAM F. RUSKA, AND
GWYNN W. RAMSEY, *Lynchburg College*

During the summer of 1966 locations in several Southwestern Virginia Piedmont Counties were visited and plant collections were made. Study of the material collected shows that distributional ranges for several taxa have been extended beyond those previously published. Many county and Piedmont records and several state records are established. The results of the study indicate that concentrated floristic studies for the Virginia Piedmont, especially for the southwestern portion, are needed. The summer's work and this report initiate that study.

(51)

Effect of L1210 Leukemia on C11/1431a Carbon Clearance in DBA/2 Mice

J. RICHARD THOMSON AND DAVID A. RINGLE,
Midwest Research Institute, Kansas City, Missouri

We have previously reported the occurrence of a rise in C11/1431a carbon clearance rates in DBA/2 mice at the terminal stage of ascitic-form L1210 leukemia (RES J. Reticuloendothelial Soc. 3:370, 1966). This finding was unexpected since Biozzi *et al.* (Bull. Assoc. Franc. Etude Cancer 64: 781-791, 1959) earlier reported an apparent terminal decrease in C11/1431a carbon clearance

in mice isologously inoculated with L1210 leukemia. Moreover, a decrease in reticuloendothelial system (RES) function is commonly found at the terminal stage of many neoplastic diseases, including leukemias. Our studies on L1210 ascitic-form leukemia have consistently shown the following effects on carbon uptake in both male and female DBA/2 mice: a marked increase in uptake by the lungs; a greatly decreased uptake by the liver and spleen; and an unusual uptake by cellular aggregations distributed in the peritoneal cavity. Quantitative recovery of carbon from the major RES organs showed that over 40% of the i.v. injected dose could not be accounted for in these organs, whereas in normal mice these organs take up most of the carbon. Additional experiments have suggested that the altered pattern of carbon uptake in L1210 leukemic mice is neither due to serum factors nor to a loss of phagocytes from the liver and spleen.

(125)

C-14 Isoleucine Studies in *Aedes aegypti*

WILLIAM L. TIETJEN, *Ga. Southwestern College*
JAMES N. LILES, *Univ. of Tennessee*

In an attempt to learn more about the role of isoleucine in the metabolism of the adult female *Aedes aegypti* and in its egg production, C-14 uniformly labeled isoleucine was fed to adult females and to larvae. At various post feeding times and stages, groups of mosquitos were sacrificed and the C-14 activity of various biochemical fractions, including lipid, sugars, free amino acids, and protein amino acids, was determined. In addition, eggs produced following C-14 feeding were analyzed in a similar manner. A report is to be made on the results of these studies.

(41)

Nonrandom Nuclear Orientation in the Ascospores of *Neurospora tetrasperma*

R. E. TOTTEN AND H. BRANCH HOWE, JR.,
University of Georgia

Genetic analysis of 80 hyphal-tip pairs from ascospores segregating for four genetic markers has shown that two of the six randomly-expected, heterokaryotic nuclear arrangements are not found. The only arrangements which are found are those giving rise to hyphae which are heterokaryotic for mating type and other markers that segregate consistently at the first division. This finding is interpreted as suggesting that the four nuclei in each ascospore undergo a directed orientation which leads to their nonrandom distribution into the hyphal tips. Cytological analysis suggests that the cause of this nonrandomness is a type of fourth divisional nuclear passing somewhat similar to the nuclear passings already known to occur earlier in ascosporeogenesis during the second and third nuclear divisions.

(130)

An Ecological Study of a Fungus Parasite in Mosquito Larvae

CLYDE J. UMPHLETT, *University of North Carolina, Chapel Hill*

Weekly samples of larvae of *Anopheles quadrimaculatus* were taken during the mosquito breeding season in

1966 from two coves, A and B, in University Lake, Chapel Hill, N. C. Larvae from Cove A were infected regularly by *Coelomomyces punctatus* in quantities varying from 6.3% to 80.8% of the samples. No infected larvae were found in Cove B. Environmental conditions in both coves were described from measurements of water and air temperatures, pH, and dissolved oxygen. The dissolved oxygen concentration and pH were much higher in Cove B than in Cove A. These factors, and the higher temperatures observed at times in Cove A, seemed to be exerting some influence on the infection potential of the fungus. In one brief laboratory experiment on emergence of adult mosquitoes from field larval collections, 76% of the larvae from Cove B (uninfected) emerged while 6.3% of those from Cove A (infected) emerged as adults. One infected imago emerged. A role for infected adult mosquitoes in the dispersal of *Coelomomyces* is possible.

(35)

Localization and Rhythmic Enzymatic Development of Essential Oils in Flowers

D. S. VAN FLEET, *University of Georgia*

Esterases, dehydrogenases and peroxidases in glandular cells producing essential aromatic oils are cyclic in their activation. Diurnal and nocturnal rhythmic cycles of mitochondrial division and enzyme activity are not changed by normal variations in temperature, light or removal of flower parts from the plant in *Cestrum nocturnum*. Essential oil end products are inhibitive to the enzymes showing rhythmic activity. Rhythmic mitochondrial and enzyme activity are not sharply detectable in many plants but a general method has been developed with aryl amines for visual localization of cells producing aromatic oils.

(32)

Genetics and Differentiation of Polyacetylenes and Polyenes in Vascular Plants

D. S. VAN FLEET

Genes for development of poly-yenes and polyenes in root, stem and leaf are in linkage groups with genes for differentiation of the endodermis. Dehydrogenase, esterase and haem containing enzymes associated with development of acetylenic and polyeneic molecules are controlled by genes which affect the development of the endodermis. Absorption spectra of double and triple bonds in acetylenic and polyenoic fatty acids allow quantitative and qualitative analysis of polyunsaturated molecules in hybrid crosses and in broad phyletic comparisons. Evolution of gene linkage groups from *Psilotum* through the *Compositae* is a result of survival value and function of the endodermis. Poly-yenes and polyenes in leaves are less common and more variable than in roots. Evolved linkage groups affecting development in leaves are evocative but unsaturation and molecular structure are finally determined by unlinked genes affecting flavone development. Conjugated polyenes may be adventively induced to form in plants lacking genes for their development.

(34)

Peroxidase Localization and Isozymic Alteration Resulting from Infection of Tobacco by *Phytophthora parasitica* var. *nicotianae*

JOSEPH A. VEECH, *University of Georgia*

The blackshank pathogen *Phytophthora parasitica* var. *nicotianae* alters the isozymic pattern (zymogram) in tobacco stem. The sequence of changes in the zymograms as they occur during the development of the disease was demonstrated by micro-disc polyacrylamide gel electrophoresis. Comparisons were made between susceptible and resistant varieties of tobacco under conditions of health and disease. Results indicate that prior to infection the zymogram of susceptible and resistant varieties are similar. However, upon infection isozymic alterations were observed. Both varieties first show an intensification of what is thought to be lipid-bound isozymes of peroxidase. As the disease progresses zymograms obtained from susceptible plants indicated a lack of stability on the part of the host to cope with the pathogen. Zymograms from resistant plants also showed alteration from the healthy, however, alternations were neither as acute nor as long lasting as those found in the infected susceptible variety.

(135)

Ultrastructure of the Fungus-Alga Association in *Cornicularia normoerica*

ALMA TOEVS WALKER, *University of Georgia*

The thick and compact cortical tissues in contrast with the arachnoid structure of the medullary tissues in the lichen *Cornicularia normoerica* (Gunn.) Du Rietz compounded penetration problems in fixing and staining the 0.5-mm. sections of this lichen for electron microscopy. Crystalline organic deposits secreted by the lichen provided an additional critical problem in securing embedment suitable for thinsectioning. Appropriate preparative techniques and fine structure studies of the fungus-alga association will be presented and discussed.

(5)

A New *Talinum* (Portulacaceae) from the Cedar Glades

STEWART A. WARE AND ELSIE QUARTERMAN, *Vanderbilt University*

The *Talinum* in the cedar glades of middle Tennessee has often been identified as *T. teretifolium* Pursh, but it is more like *T. mengesii* Wolf. In the field, cedar glade plants can be easily separated from these two species by flower and fruit characteristics. Only one of 46 attempted crosses between *T. mengesii* and the cedar glade plants produced the normal seed yield, indicating genetic as well as morphological differentiation. A new species is proposed from the cedar glades, with the name *Talinum calcaricum*. The new species, known only from six counties in the Central Basin of Tennessee and one county in northeast Alabama, is another addition to the list of cedar glade endemics. It appears to be limited to limestone outcrops; *T. mengesii* is its ecological equivalent on the sandstone outcrops of northern Alabama.

(25)

Seed Germination in Two Species of *Talinum* (Portulacaceae)

STEWART A. WARE AND ELSIE QUARTERMAN, *Vanderbilt University*

Talinum calcaricum Ware sp. nov. is a succulent perennial herb endemic to the cedar glades of middle Tennessee and northern Alabama. Its seeds, which germinate in the spring, require cold treatment (6 weeks), light, and alternating temperatures for good germination. At constant temperatures, some germination occurs at 25° C, but none at 20° or 30° C. The requirements for cold storage and light are not eliminated by laboratory dry storage, but percent germination at 25° C rises appreciably. Seeds of *T. mengesii* Wolf, a species of sandstone and other outcrops of the southeastern United States, also require cold treatment and light, but germinate better over a wider range of constant temperatures than do seeds of *T. calcaricum*. In *T. mengesii*, germination rises after laboratory dry storage, and is as good at 25° C as at alternating temperatures.

(36)

Respiratory Metabolism in the Heterothallic Water Mold, *Achlya ambisexualis* Raper

CHARLES O. WARREN, *Southwestern At Memphis*

Manometric studies of intact mycelium and spectrophotometric analyses of enzyme activity in mycelial extracts provided basic information concerning the vegetative respiratory metabolism of the heterothallic water mold, *Achlya ambisexualis* Raper (Order Saprolegniales). The measured Respiratory Quotient indicates lipid as the endogenous substrate. Enzymes representing two glycolytic pathways were demonstrated. The Hexose Monophosphate pathway was represented by glucose-6-phosphate dehydrogenase and 6-phosphogluconic acid dehydrogenase. The demonstration of 6-phosphofructokinase, aldolase, PGAL dehydrogenase, phosphoglyceromutase, and enolase indicate the presence of the Embden-Meyerhof-Parnas scheme. The effect of mycelial age on the activity of selected respiratory enzymes was studied. The presence of an operative Krebs Cycle is supported by the demonstration of isocitric dehydrogenase, α -ketoglutaric acid oxidase, succinic dehydrogenase, and malic dehydrogenase. The presence of "malic" enzyme suggests a possible mechanism for CO₂ fixation in this fungus.

Preliminary studies concerning the effects of the sex hormone, hormone A, on the respiratory rate of the male strain of this fungus were conducted.

(49)

Neurochemical Response to Environmental Stimulation

ANNEMARIE S. WELCH AND BRUCE L. WELCH, *University of Tennessee*

The central portions of the autonomic nervous system which utilize norepinephrine, dopamine or serotonin as neurotransmitter or neuromodulatory agents adapt in a very sensitive manner to different levels of demand for neurotransmitter release, such as those brought about by different levels of environmental stimulation. When stimulus is intensified neurotransmitter stores may be markedly reduced, but compensatory mechanisms rapidly

come into play; transmitter stores may increase detectably within 10-30 minutes and continue to increase for at least 1½-2 hours. When mice live in high stimulus environments, neurotransmitter metabolism is sustained at high levels. When mice are removed from such environments, neurotransmitter metabolism is slowed somewhat almost immediately, but it remains higher for at least several days than in mice adapted to living in lower stimulus environments. CNS responsivity and aggressiveness are inversely related to the sustained levels of environmental stimulation and neurotransmitter metabolism.

(31)

The Effects of Soaking Treatments and Foliar Sprays on Rooting of *Sanchezia nobilis glaucophylla*

BOOKER T. WHATLEY, STANLEY O. THOMPSON AND
MCKINLEY MAYES, *Southern University*

A randomized block experimental design with eight treatments replicated five times with one cutting per one-gallon glass jar, filled with continuously aerated distilled water, per treatment for each replication was employed to study the effects of soaking and foliar spray on rooting of *Sanchezia nobilis glaucophylla* terminal cuttings.

Highly significant differences were found among the various treatments. When soaking vs foliar spray were compared, soaking was found to be significantly better than foliar spray. The linear trend indicated that five minutes soaking was significantly better than fifteen minutes soaking which was no better than the control. The quadratic response was highly significant, indicating that ten minutes soaking was significantly better than five minutes soaking.

Foliar spray vs control, linear trend, and quadratic response was not significant, indicating that the application of foliar spray to the stock plants 5, 10 and 15 days prior to taking cuttings was no better than the control.

(138)

Notes on *Tetrasporopsis funescens*, a Fresh-Water Alga of Apparently Wide Distribution

L. A. WHITFORD, *N. C. State University*

A large palmelloid chrysophyte described from Raleigh, North Carolina in 1943 as *Phaeosphaera perforata* is almost certainly synonymous with *Tetrasporopsis funescens*, (Braun) Lemm. 1899, and synonymous with *T. reticulata* Meyer, 1927 from Lake Baikal. The species is common in late winter along the Atlantic seaboard from Mississippi to New Foundland. It has also been collected in Alaska, Germany, France, Russia and possibly England and India. It is collected in soft-water lakes and streams when water temperatures are below 12 C. Nearly spherical brownish cells are irregularly distributed in a soft, perforate or reticulate, gelatinous cylinder. Spherical silicious cysts and zoospores are produced.

(20)

A Diapause-Resistant Stock of *Mormoniella*

P. W. WHITING, *Oak Ridge National Laboratory*

At the Raleigh ASB meeting it was reported that females of this wasp parasite of blow-fly pupae after about five days of exposure to alternating 6-hour 18° C

"days" and 18-hour 12° C "nights" are so conditioned that their eggs develop into larvae which fail to pupate but pass into a dormant state called diapause. These larvae will live at room temperature without food as long as three years. About 60 genetically different stocks were proven thus to respond to these conditions and diapause larvae were obtained for convenient storage. A diapause-resistant stock has now been found which fails to produce diapause larvae or has them in very small numbers, less than 1%, even after the mothers have been in the "day-and-night box" for many days. Genetical data will be reported. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(47)

Interference with Pregnancy in the Rat by an Intracervical Suture

KATHERINE L. WIEAND AND D. A. OLEWINE,
Geisinger Medical Center and Bucknell University

Intrauterine sutures which penetrate into the uterine lumen have been shown to disrupt pregnancy in the rat. In the present investigation a silk suture (Ethcon 2-0) placed in the cervix where implantation does not normally occur, also interferes with pregnancy. Control and sham-operated animals averaged 6.2 ± 0.4 (S.E.) implantations in each uterine horn. In uteri with sutured cervixes the number of implantations was significantly reduced [2.2 ± 0.7 (S.E.)]. When placement of the suture was delayed until day 4 of pregnancy 2.9 ± 0.3 implantations were found in uteri with sutured cervixes. Also in these animals there was a significant increase in the number of abnormal implantations [2.5 ± 0.3 (S.E.)] which were consistently located in the cervix around the suture.

(122)

Facultative Diapause in *Trogoderma sternale maderae* Beal, 1954

BILLY G. WILSON AND J. J. FRIAUF, *Vanderbilt University*

The genus *Trogoderma* (Coleoptera: Dermestidae) has been studied experimentally for an unusual type of facultative diapause occurring in late larval instars. Investigations have indicated that responsible factors may be restricted space, low (but nutritionally sufficient) food volume, and accumulation of excreta. Results also indicate that low temperature, within the developmental range, will induce this diapause.

It seems to us that the results thus far are inconclusive, and that neither the environmental parameters nor the physiological mechanisms have been clearly elucidated. Accordingly, a factorial experiment was designed in which the effects of temperature, food volume, larval density, relative humidity, diet and photoperiod upon larval development are being evaluated. Among these parameters, those that appear to show a positive relationship with delayed pupation will be more critically examined in further experiments, and it seems certain that further, and perhaps more promising approaches to this total problem of facultative diapause will become evident.

(27)

Interactions of Fast Neutron Radiation and Growth-Dormancy Cycles in Yellow Poplar Trees

J. P. WITHERSPOON, *Oak Ridge National Laboratory*

In general, plants subjected to an acute exposure of ionizing radiation during active growth phases are more affected than those receiving the same exposure during dormant phases. This generalization, however, is based on the normal timing of the plant cycle. Experiments with 2-year-old yellow poplar trees which were irradiated with fast neutrons during either dormant or active phases then forced, prematurely, into opposite phases indicated that this generalization does not hold when natural timing is altered. Irradiated dormant plants were found to break dormancy before controls when forced out of dormancy in environmental growth chambers. The biological effects, however, were greater than when plants were allowed to undergo a normal dormant period. This study indicated that some repair of biological damage occurs during dormancy. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(22-64)

A Comparison of the Skulls of Young Flounders in Three Species of *Paralichthys* Girard

WILLIAM S. WOOLCOTT AND CAPERTON BEIRNE,
University of Richmond

Eighty specimens (10-56 mm st. lg.), collected in the vicinity of Beaufort, North Carolina, were used in the study. Thirty-four of these were *Paralichthys dentatus*, 27 *P. lethostigma* and 19 *P. albigutta*. Neurocranial

elements appeared similar; however, differences in 13 meristic, proportional and descriptive characters of the branchiocranium separated *P. dentatus* from the other two species. In seven characters, significant differences occurred between *P. lethostigma* and *P. albigutta*. Characters that gave the best separation were gill rakers where *P. dentatus* had the greatest number on the first gill arch, and a combination of gill rakers and the total number of left dentary teeth which gave almost 100% separation of the three species. *Paralichthys dentatus* had a longer posterodorsal spine on the left subopercle; on *P. albigutta* it was minute or absent. Also in *P. dentatus* the opercle was usually wider than deep while in the other two fishes depth was greater.

(136)

Interesting Records of Southern Appalachian and Mexican Lichens

I. YOSHIMURA AND A. J. SHARP, *University of Tennessee*

The known ranges of *Pilophoron cereolus*, *Phyllicium demangeonii* (both new to S. Appalachians), and *Coriscium viride* (new to Mexico) are extended southward. In contrast, the range of *Parmelia densirhizinata* (new to Mexico) is extended northward from Central and S. America. *Anaptychia microphylla* (new to N. America), *Anzia ornata* (new to Philippines) and the genus *Gymnoderma* show classic distribution patterns involving eastern Asia and E. North America. A new species of *Anzia* (the third *Anzia* known in North America) shows a disjunctive distribution between the Southern Appalachians and the Mexican Highlands. *Cladonia formosana* is a synonym of *Cladonia subpityrea*, which shows a disjunctive distribution between eastern Asia and the Mexican Highlands.

(Continued from page 14)

C. Ritchie Bell: Having been associated with the ASB since he came to the University of North Carolina from the University of Illinois in 1955, Dr. Bell served on the ASB Executive Committee from 1963 to 1965. He is Director of the North Carolina Botanical Garden, Chairman of the CUEBS Panel on Biological Facilities, and a Council Member of the American Society of Plant Taxonomists.

Burton J. Bogitsh: Dr. Bogitsh has served the ASB as both Chairman and member of the Research Committee. He is now Associate Professor of Biology at Vanderbilt University, having come there after serving as Assistant Program Director with the N.S.F. Prior to 1963 he was Assistant Professor at Georgia Southern College. His interest lie in the field of helminthology.

Anna Josephine Bridgman: Dr. Bridgman is Professor and Chairman of the Biology Department of Agnes Scott College — a position she has held since 1952. Her research interests deal with the encystment of, and radiation effects on, ciliates. She has been a member of the ASB since 1939, and has served on the Executive Committee.

Dorothy L. Crandall: Dr. Crandall is an Associate Professor of Biology at Randolph-Macon Woman's College. Her interests are in Plant Ecology, and she has served as Chairman of the ASB Resolutions Committee in 1962 and 1966. She has been a member of the ASB since 1950.

John Mervin Herr: A member of the ASB since 1955, Dr. Herr has served as South Carolina State Correspondent since 1964. His interests lie in the fields of tracheophyta morphology and angiosperm embryology — areas in which he has published over 20 papers. Dr. Herr is Associate Professor of Biology at the University of South Carolina.

James C. McDonald: At the time of the Wake-Forest College ASB meeting in 1962, Dr. McDonald served well as Chairman of the Local Arrangements Committee. A botanist, Dr. McDonald has been a member of the ASB since coming to Wake-Forest from the University of Missouri in 1960. His research is on the Myxobacterales.

Margaret Y. Menzel: Dr. Menzel, Associate Professor of Biology at Florida State University, has been a member of the ASB since 1949, served on the Goethe Travel Awards Committee from 1962 to 1964, and has been Secretary since 1964. Her research interests are in the

fields of cytology, cytogenetics, and plant evolution — and she was recipient of the ASB Research Award in 1950. Her husband, R. W. Menzel, is also an ASB member.

Faith S. Miller: Dr. Miller, Associate Professor of Anatomy at Tulane University, has been a member of the ASB since 1959. Her research is in the fields of asphyxia of newborn mammals, resuscitation from asphyxia and low body temperatures, and embryology of Tubularia. In 1959 she shared the ASB's research prize with Dr. J. A. Miller.

Robert B. Short: Dr. Short has been associated with

the ASB since 1951, and has served two terms on the Executive Committee (from 1959 to 1962 and from 1965 to 1968). Professor of Biology at Florida State University, Dr. Short's research interests lie in parasitology — trematodes (especially schistosomes) and in dicyemid mesozoans.

Frances E. Silliman: Dr. Silliman, Professor of Biology at Bridgewater College, has been a member of the ASB since 1953. A botanist, she is a member of the AAAS, the Botanical Society of America, the American Society of Plant Taxonomists, and the Southern Appalachian Botanical Club.



Books and Periodicals

PROTIDES OF THE BIOLOGICAL FLUIDS, Volume 13 of a series on Proteins. H. Peeters, Editor. Elvsevier Publishing Company, New York, 1966. 476 pp.

This book is the result of a Colloquium held in Bruges, Belgium. The academic lecture presented by Z. Dische is a resume of biochemistry during the past 20 years involving conjugated proteins in "informational processes." The suggestion is intriguing that glycoprotein functions as a carrier of biological information. It is particularly interesting that in the presentation of the universal animal concept, a sugar conjugated with a hydrophobic group in some form is universal and functions in developmental processes.

Four major areas are treated by individuals from several countries. A few of the presentations are in the native language but these have summaries in English. The material in the book includes neuroproteins (53%), lipoproteins (31%), dispersion phenomena (9%), and "various papers" (7%). The "various papers" section ranges from studies of the Klinefelter syndrome, to immunopolymerisation (German), to immunological reactions (French).

The composition and metabolism of neuroproteins of the central nervous system and peripheral nerves were discussed in relation to anabolism and catabolism. Synthesis and breakdown activities of enzymes were the primary concern with rather complete methods of experimentation accompanying the data presented. As a corollary, additional information is presented about the intercomplexities of nervous tissue components and constituents.

Some of the more recent results of European workers' findings in magnetic and optical dispersion in the field of protein research are contributing to the rapidly expanding information. — JOHN F. DIMMICK, *Wake Forest College*.

THE BIOLOGY OF POPULATIONS. Robert MacArthur and Joseph Connell. John Wiley & Sons, New York. 200 pp. 1966. \$5.95.

This is one of three books in a "levels of organization" series (Cells, Organisms, Populations). Although one's understanding of the relation of properties and behavior at one level to each of the other levels would be enriched by reading the entire series, the volume concerned with populations may be profitably read alone by anyone exposed to the basic concepts of biology. In the foreword the authors state their intent to present science as a process as well as a body of knowledge. As a result the evidence and reasoning leading to each concept of population biology is explained in

detail with extraordinary clarity but with a remarkable economy of words. Thus the book serves to introduce the student to the intellectual revolution which biology is undergoing and enables established biologists to re-examine some cherished concepts and beliefs. The book is divided into three parts: 1. *The Patterns* which includes such subtopics as the challenge of a fluctuating environment, some patterns in space, the patterns of single-species populations, and the general circulation of the atmosphere. 2. *The Evolution of Populations* with discussions of the process of natural selection, the maintenance of variability, group selection, and other related topics. 3. *The Functioning of Populations* which constitutes nearly half the text covers population integration, growth, regulation, various population interactions, ecological communities and allied topics. I enjoyed reading this book and will undoubtedly do so many more times. JOHN CAIRNS, JR., UNIV. OF KANSAS.

BASIC ARTHROPODAN STOCK, with Special Reference to Insects. A. G. Sharov. Pergamon Press, Oxford; New York. xii + 271 pp.

Phylogeny continues to interest biologists. Our minds are such that we take the same (perhaps childish) delight in knowing (or believing) that insects are related to snails as we do in knowing (or believing) that our colleague is descended from Irish kings; and a phylogeny is a scheme of relationships, a genealogy, that serves as a test of our theories of systematics and our classifications and as an important confirmation of theories of the mechanisms of evolution. Yet successful phylogenies are rare, and in the broad sense of a scheme expressing the genealogies of major groups of organisms, perhaps non-existent.

It was with some anticipation, then, that I received a review copy of this book by the eminent Russian student of insectan palaeontology, a member of U.S.S.R. Academy of Sciences. There are ten chapters, unnumbered sections entitled "Introduction" and "Conclusions", a long list of references (many to titles in Russian and other languages of which American students often may not be aware) and what appears to be an adequate index. From the Zoology Division of the Pergamon Press' "Series on Pure and Applied Biology", the book is well made and printed and the illustrations are beautifully done.

Not many American students, I suppose, will be pleased with Sharov's classification in which all annelids and arthropods are grouped in four subphyla under the Cuvierian phylum Articulata. Still fewer will accept the conclusion, reached after a review of the classical theories of annelidan origins have been presented, that the annelids are descended from cteno-

phores or that the polychaete family Spintheridae is composed of primitive annelids. Unfortunately Sharov wrote either before R. B. Clark's work (1964. *Dynamics in Metazoan Evolution*. Clarendon Press, Oxford.) on the significance of the hydrostatic skeleton in the evolution of the burrowing ancestors of the annelids or without a knowledge of Clark's work, though, of course, Clark had numerous predecessors. One cannot any longer believe that the earliest annelids were flattened, creeping forms or that their coelomic spaces were derived from the gastric pouches of coelenterates or ctenophores.

In the second chapter on the origin of arthropods from proto-annelids and the relationship of arthropods to molluscs there is much of interest, though the use of unfamiliar names, e.g., Malocopoda (or is it Malacopoda? both spellings occur) for the Onychophora, unnecessarily increases the difficulty of the chapter. And I was surprised to learn that the pycnogonids, assigned to a new superclass Proboscifera, are closely related to the first arthropods. This conclusion is based upon a presumed resemblance between the proboscis of pycnogonids, that of the Middle-Cambrian *Opabinia regalis* Walcott and the "erectile" (eversible) pharynx of some modern annelids. Sharov has a truly impressive knowledge of fossil arthropods and has read amazingly widely in the literature of arthropod anatomy and phylogeny, but one is startled by such dogmatism as that on page 44, "Størmer was in error . . .", when a careful reading of the evidence leaves one unconvinced of the "truth" of either Størmer's or Sharov's views. This sort of thing occurs frequently in Sharov's book.

Eight chapters and approximately 175 pages are devoted to the palaeontology, anatomy, embryology and relationships, derived from such studies, of the insects to other arthropods, particularly to the Crustacea and/or those primarily terrestrial groups known as the Mandibulata or Labiata (but not so-called by Sharov). Here one not versed in insect morphology (I am not) may find sticky going. But there is a wealth of information about fossils and though the arguments and counter-arguments of all the prominent students (e.g., Crampton, Snodgrass, Tiegs, Manton and many others) of insect phylogeny are reviewed and the conclusions frequently seem indecisive, I suppose no one will be greatly opposed to the author's decision concurring in the removal of the Protura, Collembola and Diplura as separate classes from the class Insecta for which is retained the traditional division into the subclasses Apterygota (the orders Monura, for a machilid-like Permian fossil, and Thysanura) and the subclass Pterygota.

The book concludes with a few pages of "Conclusions" and a brief phylogenetic "tree", which Sharov says is the thesis of his entire book, which derives Onychophora and Arthropoda as separate subphyla from lobopod annelids; the primitive arthropods were Proboscifera (an extinct class and the Pycnogonida); these

gave rise to Trilobitomorpha which in turn produced Crustacea on one hand and Chelicerata on the other; and, finally, the Crustacea gave rise to what the author calls the Atelocerata (those mandibulate arthropods with one pair or no antennae).

The merit of this book, particularly for those of us who have perhaps too closely followed Snodgrass, is the wealth of palaeontological material and the discussions of the views of many students of arthropod phylogeny. From the standpoint of a neontologist, the demerits center around a slighting of considerations of the adaptive values of the changes that have produced the varied groups of arthropods. As one highly speculative matter, there is not here (and I know of no place where there is) any real consideration of the origin of the feature which makes an arthropod, the chitinous, usually sclerotized, exoskeleton. Sharov believes the annelids arose from crawling forms on the bottom of the sea and arthropods from similarly bottom crawling annelids, a sort of "straight-line" evolution that as presented leaves me with the uncomfortable feeling that there is some mysticism here. I would like to commend to the students of annelid-arthropod evolution the views of Clark (*op. cit.*) on the origins of the coelom and metamerism as adaptive features, at least among the annelids, to a burrowing existence. And why didn't the exoskeleton arise as an adaptation to a strand-line existence? It seems the hazards of alternate wetting and drying, the dangers of exposure to direct sunlight, the increased "need" for support for semi-terrestrial organisms, protection against the abrasive effects of a pounding surf that may have worked on rather large pieces of plant material as well as sand and gravel, among possibly other factors, including a rich source of food in the strand-line debris, could have constituted a set of circumstances conducive to, through quite usual processes of natural selection, the evolution by annelids of the exoskeleton and jointed legs that made arthropods of some of them. — PERRY C. HOLT, DEPARTMENT OF BIOLOGY, VIRGINIA POLYTECHNIC INSTITUTE.

Books Recently Received

Reinhold Publishing Corp.

Langley, L. L. and E. Cheraskin. 1965. *PHYSIOLOGY OF MAN* (third edition). 658 pp. \$8.50.

Polikarpov, G. G. 1966. *RADIOECOLOGY OF AQUATIC ORGANISMS*. 314 pp. \$16.50. This book presents the first systematized account of substantiation of concepts and problems on the laws of interrelation between marine organisms and radioactive environment. Full data are reported on the concentration factors of radioactive isotopes and their carriers from 8 groups of the periodic system of chemical elements by marine plants and animals, as well as material on radiosensitivity and radioresistance of

various hydrobionts. The book is intended for specialist in radioecology, radiobiology, hydrobiology, ecology, oceanology, biochemistry, and conservation of natural resources.

Wood, E. J. Ferguson. 1965. MARINE MICROBIAL ECOLOGY. 243 pp. This book presents the reader with a comprehensive survey of the subject, indicating the most recent developments in this relatively new discipline. It discusses the microbes of the sea which, from the surface of the ocean to its depths, play a vitally important role at the first trophic level where solar energy is converted into biologic energy, and at the last trophic level where organic matter is degraded and destroyed.

Prentice-Hall, Inc.

Bradshaw, L. Jack. 1966. INTRODUCTION TO MOLECULAR BIOLOGICAL TECHNIQUES. 171 pp. (paper). This book was written for undergraduate majors in biology, with the background of general chemistry and physics. The experiments, therefore, have been chosen to illustrate techniques in as simple a way as possible—and the major purpose of this work is to introduce the student to the idea that good research methods must often be developed as an art, and that some experience is necessary to make the techniques consistently reliable.

Brock, Thomas D. 1966. PRINCIPALS OF MICROBIAL ECOLOGY. 306 pp. \$7.75. This book is the first to integrate the sub-fields, such as soil microbiology, food microbiology, marine microbiology, medical microbiology, etc. and to provide a unified treatment of the entire subject. Among its features are indications of how modern techniques of microbiology and molecular biology can be applied to ecology problems. An extensive review of the literature is provided, citing over 450 references.

Davis, Bernard D. and Leonard Warren. 1967. THE SPECIFICITY OF CELL SURFACES. 290 pp. \$10.25. This volume comprises papers presented at a symposium held under the auspices of the Society of General Physiologists at Woods Hole, Mass., 1-4 September 1965. The contributions survey present knowledge of surface macromolecules that have lent themselves to chemical analysis, describe systems that still await analysis, and discuss techniques for the purification of cell membranes.

Hayashi, Teru and Andrew G. Szent-Györgyi. (eds.) 1966. MOLECULAR ARCHITECTURE IN CELL PHYSIOLOGY. 252 pp. \$7.50. This volume comprises the papers presented at a symposium held under the auspices of The Society of General Physiologists at its annual meeting at The Marine Biological Laboratory, Woods Hole, Massachusetts, 8 through 11 September, 1964. The four sections included in the book are "basic chemical theory", "molecular archi-

itecture of proteins", "molecular architecture and cell information", and "molecular architecture and biological structures."

Hoar, William S. 1966. GENERAL AND COMPARATIVE PHYSIOLOGY. 815 pp. \$15.50. An integrated account of the principals of physiology, emphasizing the evolution of animal processes in relation to the environment. Ecological physiology is treated in sections dealing with compensation for environmental changes, temperature, gases, salinity, light, and pressure. Examples are drawn from many levels to stress the probable physiological mechanisms whereby animals acquire food, channel it into chemical energy, dispose of waste, and integrate these many operations.

Kihlman, Bengt A. 1966. ACTIONS OF CHEMICALS ON DIVIDING CELLS. 260 pp. \$7.50. This book presents selected studies of the effects of certain widely used chemicals on chromosome structure and itosis. The studies were done primarily on mammalian cells in tissue culture and on root-tip cells of higher plants. Emphasis is on the mechanism of action of the chemicals. Attempts have been made to explain the cytological effects in biochemical terms. Over 500 references are included.

Ross, Herbert H. 1967. UNDERSTANDING EVOLUTION. 175 pp. \$4.95. Stressing the ever increasing complexity of living things, Ross cites the great variation and development of the two million or more kinds of plants and animals now in existence. He contends that the steady flow of mutations, the process of natural selection, and the geotectonic factor with its changing of the earth's crust—all acting perpetually and simultaneously—have resulted in the intricate organization of life that we see in the world today. The process of evolution still continues, Ross observes, and "the one certainty about the universe and life upon this planet is that they always have changed and always will."

Stebbins, G. L. 1966. PROCESSES OF ORGANIC EVOLUTION. 191 pp. \$2.50 (paper). This book is design to serve as a basic or supplementary text, presenting the undergraduate student with an account of the basic processes of evolution as they have been analysed and clarified during the past 40 years.

University of Illinois Press

Daubs, Edwin Horace. 1965. A MONOGRAPH OF LEMNACEAE. 118 pp. \$4.50 (cloth), \$3.50 (paper). (Monograph 34).

Brandon, Ronald A. 1966. SYSTEMATICS OF THE SALAMANDER GENUS *GYRINOPHILUS*. 86 pp. \$5.50 (cloth), \$4.50 (paper). (Monograph 35).

List, James Carl. 1966. COMPARATIVE OSTEOLOGY OF THE SNAKE FAMILIES TYPHLOPIDAE

AND LEPTOTYPHLOPIDAE. 112 pp. \$4.75 (cloth), \$3.75 (paper). (Monograph 36).

Schmidt, Anthony J. 1966. THE MOLECULAR BASIS OF REGENERATION: ENZYMES. 78 pp. \$4.50 (paper), (Monograph and Medical Sciences, 6(4).)

McGraw-Hill Book Company

Morris, Ramona and Desmond. 1966. MEN AND APES. 271 pp. \$7.95.

Morris, Ramona and Desmond. 1966. MEN AND PANDAS. 233 pp. \$7.95.

Pergamon Press, Inc.

Mamikunian, G. and M. H. Briggs (eds.). 1965. CURRENT ASPECTS OF EXO BIOLOGY. The contributed papers in this volume present the early stages in the scientific formulation of exobiology, and indicate the multidisciplinary impetus of the physical and biological sciences that collectively constitute the working apparatus of exobiology. The search for other life within our solar system is perhaps the most difficult undertaking of our era. The biological exploration of Mars is planned for opposition opportunities of 1969, 1971, and 1973 — and should any of these missions indicate the presence of biota, exobiology must then meet the challenge as an established discipline in its own right.

John Wiley & Sons

Boolotian, Richard A. (ed.). 1966. PHYSIOLOGY OF ECHINODERMATA. 822 pp. \$45.00. Thirty-one authorities in the field give a detailed, scholarly account of existing knowledge of the biology and biochemistry of the echinoderms. Previously unpublished information is presented, and attention is focused on unanswered questions. A bibliography of all major publications dealing with echinoderms is presented.

Borkovec, Alexej B. 1966. INSECT CHEMOSTERILANTS. 143 pp. \$6.95. A compilation of the pertinent information currently available on chemosterilants. The author is primarily concerned with the diverse features of chemosterilant compounds and their varying effects on different insect species. A bibliography, complete up to April, 1966, is presented.

Buchner, Paul. 1965. ENDOSYMBIOSIS OF ANIMALS WITH PLANT MICROORGANISMS. (Revised English version.) 909 pp.

Greulach, Victor A., and J. Edison Adams. 1967. PLANTS: AN INTRODUCTION TO MODERN BOTANY. 636 pp. \$8.50. Although the book is designed for a one-term course, it can be effectively used for the first term of a year course in botany, or for a year course in general biology in conjunction with a one-term zoology text.

W. H. Freeman

McGaugh, James L., Norman M. Weinberger, and Richard E. Whalen (eds.). 1967. PSYCHO BIOLOGY: THE BIOLOGICAL BASES OF BEHAVIOR. 381 pp. \$10.00 (cloth); \$5.45 (paper). This book contains 45 papers selected to provide a representative view of some of the basic research areas in psychobiology — the study of the biological mechanisms underlying behavior. The papers, reprinted from Scientific American, impart an appreciation of the issues and methodology in the field, and each article is provided with an introduction that puts it in perspective and gives it focus.

American Elsevier Publishing Company, Inc.

Kershaw, Kenneth A. 1964. QUANTITATIVE AND DYNAMIC ECOLOGY. 183 pp. \$5.00.

Barron's Educational Series, Inc.

Rodgers, C. Leland. 1967. ESSENTIALS OF BIOLOGY. 551 pp. \$2.50 (paper). This book presents a compilation of subjects often used in the beginning course, and interpretations are in conformity with modern practice. It is an up-to-date study guide, reference, and review book on the basic topics essential for a good foundation in modern biology. Included are cell structure and function, the role of D.N.A. and RNA, the release and harvesting of energy, and a glossary of over 450 biological terms.

Dover Publications, Inc.

Allen, Robert Porter. 1942. THE ROSEATE SPOONBILL. 142 pp. \$2.00 (paper).

Chapman, Frank M. 1895. HANDBOOK OF BIRDS OF EASTERN NORTH AMERICA. 581 pp. \$3.00 (paper).

Kalm, Peter. 1937. TRAVELS IN NORTH AMERICA: THE AMERICA OF 1750. 2 Volumes. 797 pp. \$2.50 per volume (paper).

Kofrad, Carl B. 1953. THE CALIFORNIA CONDOR. 154 pp. \$2.00 (paper).

Singh, Jagjit. 1966. GREAT IDEAS IN INFORMATION THEORY, LANGUAGE AND CYBERNETICS. 338 pp. \$2.00 (paper).

Tanner, James T. 1942. THE IVORY-BILLED WOODPECKER. 111 pp. \$2.00 (paper).

PROCEEDINGS of the Second Annual American Water Resources Conference (sponsored by the American Water Resources Association and held at the University of Chicago, Chicago, Illinois on November 20-22, 1966) have been published. They contain 42 papers presented at the Conference. The price of the PROCEEDINGS is \$6.00 plus postage. It is \$5.00 for members of American Water Resources Association and for Conference participants, if prepaid. Send orders to: Circulation Manager, AWRA, P. O. Box 434, Urbana, Illinois 61801.

NATIONAL SYMPOSIUM
on
GROUND-WATER HYDROLOGY
SAN FRANCISCO, CALIFORNIA
NOVEMBER 6-8, 1967

A National Symposium on Ground-Water Hydrology will be held in San Francisco, California, on November 6-8, 1967, sponsored by the American Water Resources Association.

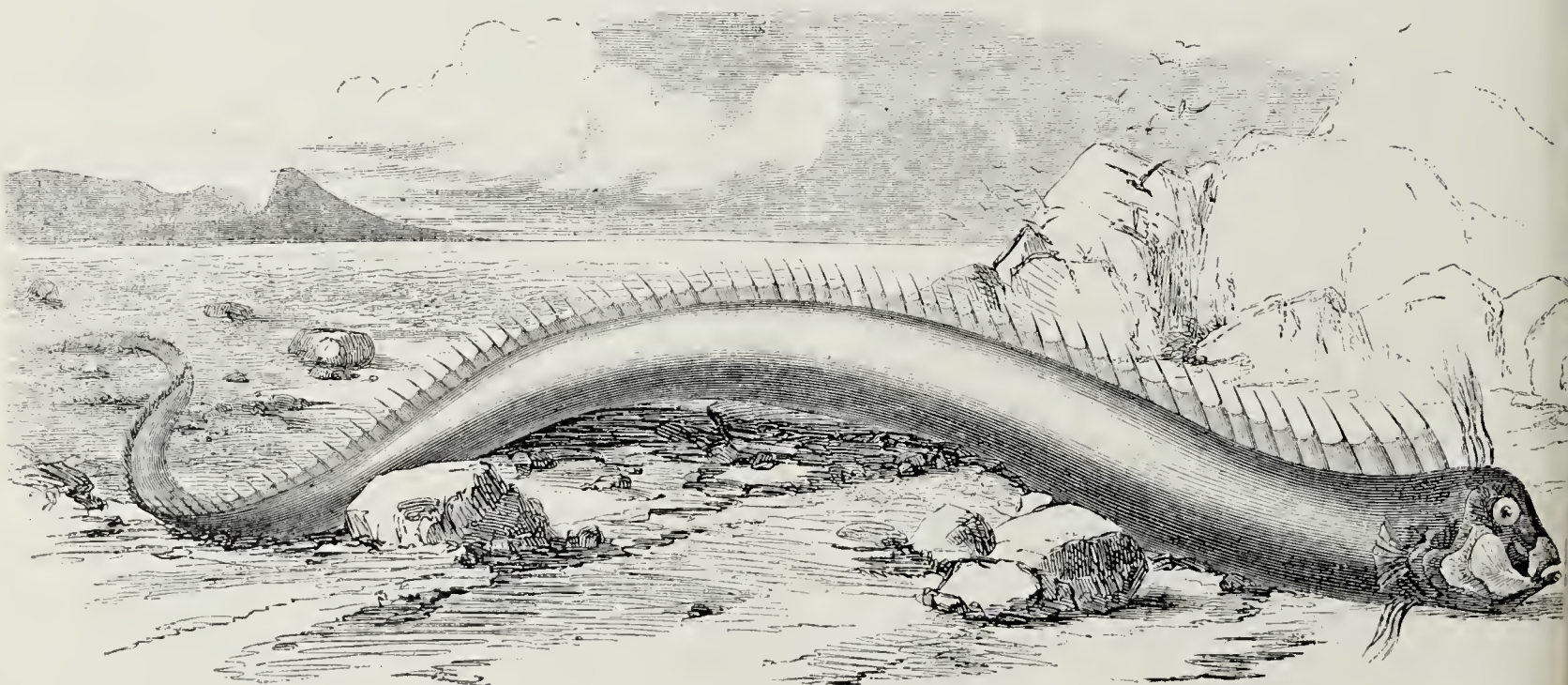
The Symposium will be divided into four sessions: (1) Occurrence of Ground Water in Different Geologic Environments, (2) Ground-Water Movement and Well Hydraulics, (3) Sea-Water Intrusion, Artificial Recharge, and Surface Water-Ground Water Relationships, and (4) Model and Radioisotope Techniques in Ground-Water Resources Investigations.

Further details on the Symposium may be obtained from: Program Chairman, Symposium, AWRA, P. O. Box 434, Urbana, Illinois 61801.

THIRD (ANNUAL)
AMERICAN WATER RESOURCES
CONFERENCE
SAN FRANCISCO, CALIFORNIA
NOVEMBER 8-10, 1967

The Third American Water Resources Conference will be held in San Francisco, California, on November 8-10, 1967, sponsored by the American Water Resources Association. The deadline for submitting abstracts of papers for consideration is July 1, 1967.

For further information please write to the Chairman of the Program Committee, Archie E. Stone, Vice-President, International Engineering Company, 74 New Montgomery Street, San Francisco, California 94105, or to The Secretary, American Water Resources Association, P. O. Box 434, Urbana, Illinois 61801.



News of Biology in the Southeast

NOTICE. — To facilitate further news coverage by the *ASB Bulletin*, a repository for news items will be provided at the registration desk during the Columbia meetings. Items thus submitted will be used in the July issue.

About People

William W. Miller, III, Associate Professor of Biology, Samford University, Birmingham, has been appointed Vice-President of the Biological Sciences Section of the Alabama Academy of Science for 1967.

William Mike Howell, has been appointed Assistant Professor of Biology, Samford University, Birmingham. He was formerly at the University of Alabama.

R. Winston Menzel, Associate Professor, Department of Oceanography, Florida State University, has received a grant from the NSF for a two year period entitled "Cytotaxonomy of related species of pelecypod mollusks." The major portion of the research will be on the species of quahog clams (*Mercenaria*) and species of oysters of the genus *Crassostrea*.

L. A. Whitford, Department of Botany, North Carolina State University, Raleigh, and **G. J. Schumacher**, New York State University, Binghamton, are preparing a manual of the fresh-water algae of North Carolina. The manual will comprise some 340 pages and illustrate and note the distribution of over 1700 taxa.

The annual invitation lecture of the Phycological Society of America will be given by **L. A. Whitford**, Department of Botany, North Carolina State University, Raleigh, at the AIBS meetings, College Station, Texas, August, 1967.

Jay Barton, II, became Chairman of the Department of Biology, West Virginia University, January 1, 1967, succeeding **Earl L. Core**, who had been head of the department since 1948. Dr. Core will remain on the staff as Professor of Botany and will continue his work on the Appalachian flora.

On April 24, **Stanwyn G. Shetler**, Associate Curator in the Smithsonian Institution's Department of Botany and secretary of the Editorial Committee of *Flora of North America*, will give a seminar at Duke University, Durham, N. C., on the topic "*Flora of North America — A New Synthesis*." Time is set for 4:15 PM in the Department of Botany.

During the past six months members of the Smithsonian Institution's Department of Botany (U. S. National Herbarium) have actively engaged in foreign travel in connection with their researches. Last summer **Dan H. Nicolson** and family left for a year in Nepal, where Dr. Nicolson will serve as a "Research Botanist" under the Fulbright Scholars' program, and **Egbert H. Walker** did fieldwork in the Ryukyu Islands on its flora. Both Dr. Walker and **Mason E. Hale** attended the Pacific Science Conference in Tokyo. During the fall months, **Thomas R. Soderstrom** headed an exhibits expedition to the Paramo in Columbia; **Velva E. Rudd** attended the Mexican Botanical Congress and did fieldwork in Mexico and Jamaica; and **Lyman B. Smith** studied types of the Bromeliaceae in numerous European herbaria, financed by a grant from the Smithsonian Research Foundation. **Wallace R. Ernst** was also awarded a grant from the Foundation to study collections of Papaveraceae in European herbaria, and he left in early February, 1967, for a 4-6-month tour of herbaria, including principally those in Western Europe but also, hopefully, the herbaria in Leningrad and Moscow. He expects to spend some time in the field in the Mediterranean region.

Denzel E. Ferguson, Professor of Zoology, Mississippi State University, has been named Editor-elect of *Herpetologica*, published by the Herpetologist's League. He will assume the office 1 January, 1968, succeeding **William Tanner**, Brigham Young University. Dr. Ferguson is also Vice-president and Program Chairman of the Southeastern Section of the American Society of Ichthyologists and Herpetologists, which group will meet with ASB in Columbia.

Sylvia A. Earle, Resident Director of the Cape Haze Marine Laboratory, has been appointed Research Fellow at the Farlow Herbarium, Harvard University for 1967-1968. During this time, Dr. Earle will be studying

marine plants collected during expeditions aboard the R/V Anton Bruun.

On January 1, 1967, **Richard T. Hanlin** transferred to the University of Georgia, Athens, as Associate Professor, Department of Plant Pathology and Plant Genetics, where he will help develop a graduate program in mycology. Dr. Hanlin will also serve as curator of the mycological herbarium.

John E. Pauly, Associate Professor of Anatomy, Tulane University, recently received a Lederle Medical Faculty Award for 1966-1969. Dr. Pauly has been carrying on research on circadian rhythms, and on electromyography. In addition he has just published, with **Hans Elias**, the 3rd Edition of "Human Microanatomy."

C. R. Austin, Professor of Embryology, Department of Anatomy, Tulane University, and Head, Genetic and Developmental Disorder Research Program, Delta Regional Primate Center, has accepted the offer of a Chair at Cambridge University entitled The Charles R. Darwin Chair of Reproductive Physiology, and will return to England in October, 1967.

James A. Miller, Jr., Chairman, Department of Anatomy, Tulane University, was an invited speaker at a Ross Conference on Pediatric Research held in San Juan, Puerto Rico, on January 23, 24, and 25. The central theme of the conference was "Brain Damage in the Fetus and Newborn from Hypoxia or Asphyxia," and Dr. Miller spoke on "Effects of Hypothermia, THAM and Glucose upon tolerance to Asphyxia in Newborn Mammals."

W. Ralph Singleton, Miller Professor of Biology, University of Virginia, was elected Vice-president of the American Genetic Association on 25 January 1967. Dr. Singleton has just completed a term as secretary of the Association.

Raymond L. Taylor, Associate Administrative Secretary of AAAS, has retired as of 31 January 1967, after eighteen years of service. Among various expressions of appreciation, he was made a life member of AAAS. Dr. Taylor is and remains an active, faithful member of ASB. The editor understands that Dr. Taylor intends to remain active in science and continue his many fine contributions. Dr. Taylor has been succeeded by **Daniel Thornhill**, Meeting Manager, who was formerly an official of the Engineering Division of NAS-NRC, and by **Walter G. Berl**, Meeting Editor. Dr. Berl will still spend two-thirds of his time at the Johns Hopkins Applied Physics Laboratory, Silver Springs, Maryland.

On October 1, 1966, **George Sprugel, Jr.** became Chief of the Illinois Natural History Survey, Urbana, Illinois. For several years prior to that time he served as Chief Scientist in the Washington office of the National Park Service.

Irwin R. Konigsberg has joined the Faculty of the University of Virginia as Professor of Biology. He received his doctorate at The Johns Hopkins University and has served previously as Staff Member, Carnegie Institute of Washington, Department of Embryology. His major research interests are: The cytodifferentiation of skeletal muscle cells, the developmental properties of clonal populations of embryonic cells in vitro, and the role of cell interactions in cytodifferentiation in vitro.

W. Gerald Robison, Jr. has joined the Faculty of the University of Virginia as Assistant Professor of Biology. He received his doctorate at University of California (Berkeley) in genetics where he also served as Postgraduate Research Geneticist and Postdoctoral Research Fellow in Anatomy. His major research interests are: Sperm differentiation, cell motility, cell biology, and electron microscopy.

M. Lüscher, Professor, University of Bern, Switzerland is working as a visiting scientist in the biological laboratories of the University of Virginia during the period between October, 1966 and March, 1967. Dr. Lüscher is interested in insect endocrinology.

Isabelle B. Sprague, Professor, Department of Biological Sciences of Mount Holyoke College, Mount Holyoke, Massachusetts, is working as a visiting scientist in the biological laboratories of the University of Virginia during the period between September, 1966, and June, 1967. Dr. Sprague is interested in insect development and physiology.

Heinz-Werner Kuethe is working in the biological laboratories of the University of Virginia as a post-doctoral fellow during the period between February, 1965, and April, 1967. Dr. Kuethe received his doctorate from University of Marburg, Germany and is interested in insect embryology.

Volprecht Maul is working in the biological laboratories of the University of Virginia as a post-doctoral fellow during the period between November, 1966 and September, 1967. Dr. Maul received his doctorate from University of Marburg, Germany and is interested in insect embryology.

Elias Shaaya is working in the biological laboratories of the University of Virginia as a post-doctoral fellow during the period between September, 1966 and August, 1967. Dr. Shaaya received his doctorate from The Hebrew University of Jerusalem and is interested in insect hormones.

About Institutions and Projects

The Smithsonian Institution now has available two new bibliographies by Elaine R. Shetler which will be of interest to high school and college teachers of botany: "Selected Guides to the Wildflowers of North America", and "Floras of the United States, Canada, and Greenland - A Selected Bibliography with Annotations." Both will be sent free upon request to the Chairman, Department of Botany, Smithsonian Institution, Washington, D. C. 20560.

The Editorial Committee of Flora of North America held its first meeting at the Smithsonian Institution on January 30-31, 1967, to lay the groundwork for the project, now officially underway. Members of the Committee are: Peter H. Raven (chairman), Stanford University; Stanwyn G. Shetler (secretary), Smithsonian Institution; John H. Beaman, Michigan State University; Kenton L. Chambers, Oregon State University; Robert Kral, Vanderbilt University; Walter H. Lewis, Missouri Botanical Garden; John T. Mickel, Iowa State University; Roy L. Taylor, Plant Research Institute, Ottawa; John H. Thomas, Stanford University. The meeting was organized and financed by the Smithsonian Institution, with William L. Stern, Chairman of the Department of Botany, serving as chairman *pro tem* of the Steering Committee of FNA. Attending *ex officio* was Robert F. Thorne, Santa Ana Botanic Garden, chairman of the Advisory Council of FNA. Also, Professor V. H. Heywood, secretary of the Editorial Committee of *Flora Europaea*, was brought over by the Smithsonian to consult with the FNA committee at this first meeting. Following the two-day meeting, Prof. Heywood gave a public seminar on February 1 at the Smithsonian on the subject "*Flora Europaea*, Its Conception and History." After his visit to Washington he spent several days at the University of Texas in the laboratory of B. L. Turner.

The Institute of Ecology, University of Georgia, will conduct studies, under the general management of Battelle Memorial Institute, Columbus, Ohio, of movement and storage of potential fallout radionuclides in the tropical forest ecosystems of Panama and Colombia. The work is related to bioenvironmental feasibility studies for the possible use of nuclear devices for construction of a sea-level canal in the American isthmian region. A research team consisting of faculty members and graduate students under the direction of Frank B. Golley and John T. McGinnis will be in the field during

the year 1967 collecting data on forest elemental storage and cycling characteristics and the nature by which radionuclides might be transmitted to man via food chains. The University of Georgia work is part of a large scale hazard analysis program using mathematical models containing information obtained from the studies of terrestrial, agricultural, freshwater, estuarine and marine environments as related to human ecology. These studies are being conducted for the Nevada Operations Office of the U. S. AEC as a part of the overall feasibility study of the Atlantic-Pacific Interoceanic Canal Commission.

The 17th Annual Wildflower Pilgrimage sponsored in part by the Department of Botany, The University of Tennessee, will be held at Gatlinburg, Tennessee, in the Great Smoky Mountains National Park April 27-29, 1967. For further details write to the Department of Botany, University of Tennessee, Knoxville, Tennessee 37916.

SOUTHEASTERN FLORA PROJECT

This project is now essentially organized and underway. Its general objectives are:

- a) To survey floristically the forested region of the southeastern United States west to the prairie and north to the terminal moraines. The states to be included are Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Tennessee, Kentucky, and West Virginia. Notation of presence in the adjacent states of Texas, Oklahoma, Missouri, Illinois, Indiana, Ohio, Pennsylvania, and New Jersey will be made.
- b) To produce a Manual which will include keys, diagnostic illustrations of at least one species per genus or section, descriptions, habitats, distributional data, and pertinent synonymy to every vascular species growing without cultivation in Southeastern United States.

The resulting manual should be useful to taxonomists, geographers, ecologists, foresters, wildlife workers, conservationists, garden club members, teachers, and amateurs. The research will be based on existing herbarium material, new field collections and pertinent literature.

The total project is to be directed and edited by an Editorial Board composed of Lloyd H. Shinnars, Southern Methodist University; Earl L. Core, West Virginia University; Wilbur H. Duncan, University of Georgia; Robert L. Wilbur, Duke University; James W. Hardin, North Carolina State University; C. Ritchie Bell and

Albert E. Radford (Chairman), University of North Carolina, Chapel Hill.

The author contributors will be: W. P. Adams, DePauw University; J. R. Baird, Washington & Lee University; C. R. Bell, University of North Carolina; J. R. Bozeman, University of North Carolina; E. T. Browne, Jr., University of Kentucky; R. C. Clark, University of North Carolina; R. T. Clausen, Cornell University; E. L. Core, West Virginia University; D. S. Correll, Texas Research Foundation; P. J. Crutchfield, Methodist College; C. E. DePoe, Northeast Louisiana State College; H. R. DeSelm, University of Tennessee; Gordon DeWolf, Georgia Southern College; W. H. Duncan, University of Georgia; W. R. Ernst, Smithsonian Institution; Murray Evans, University of Tennessee; Shirley A. Graham, Kent State University; J. W. Hardin, North Carolina State University; Francia Hommersand, University of North Carolina; J. H. Horton, Western Carolina College; F. C. James, University of North Carolina; S. B. Jones, Jr., University of Southern Mississippi; Carl Keener, Pennsylvania State University; Robert Kral, Vanderbilt University; Sidney McDaniel, Florida State University; K. A. Nicely, Western Kentucky University; D. M. Porter, Samford University; T. M. Pullen, University of Mississippi; A. E. Radford, University of North Carolina; G. S. Ramseur, University of the South; P. H. Raven, Samford University; J. D. Ray, University of South Florida; R. W. Read, University of West Indies; C. M. Rogers, Wayne State University; N. H. Russell, Central State College; A. J. Sharp, University of Tennessee; Lloyd Shinnars, Southern Methodist University; L. B. Smith, Smithsonian Institution; D. E. Stone, Duke University; J. W. Thieret, University of Southwestern Louisiana; J. L. Thomas, University of Alabama; G. E. Tucker, Arkansas Polytechnic College; D. B. Ward, University of Florida; H. A. Wahl, Pennsylvania State University; and R. L. Wilbur, Duke University.

The exchange contributing institutions and local collectors are:

Delaware — Delaware State College, N. H. Dill.

Maryland — University of Maryland, R. G. Brown; Frostburg State College, M. L. Brown.

Virginia — Virginia Polytechnic Institute; Longwood College, A. M. Harvill; Lynchburg College, G. W. Ramsey; Virginia Military Institute, Oscar Gupton; Old Dominion College; College of William and Mary, G. W. Hall.

North Carolina — Appalachian State College, I. W. Carpenter; Atlantic Christian College, J. P. Tyndall; Campbell College, L. S. Beard; Davidson College, Tom Daggy; Duke University, R. L. Wilbur; East Carolina College, Christine Wilton; Methodist College, P. J. Crutchfield; North Carolina State University, J. W. Hardin; Pembroke State College, R. F. Britt; Pfeiffer College, John Speer; University of North Carolina at Chapel Hill, A. E. Radford; University of North Carolina at

Charlotte, J. F. Matthews; Wake Forest College, R. L. Wyatt; Warren Wilson College, R. C. Duntun; Western Carolina College, J. H. Horton; Wilmington College, D. E. Harrison.

South Carolina — University of South Carolina, W. T. Batson; Converse College, R. W. Powell, Jr.; Erskine College, W. L. Ellison; Furman University, C. L. Rodgers; Lander College, Shelton Stewart.

Georgia — University of Georgia, W. H. Duncan; Georgia Southern College, Gordon DeWolf; Oglethorpe University, Judy T. Morgan; Valdosta State College, W. R. Faircloth.

Florida — University of Florida, D. G. Ward; Florida State University, Sidney McDaniel; University of South Florida, R. W. Long.

Alabama — University of Alabama, J. L. Thomas; Alabama College, P. G. Beasley; Florence State College, A. L. Hershey; Auburn University, A. C. Koelling.

Mississippi — University of Mississippi, T. J. Pullen; University of Southern Mississippi, S. B. Jones, Jr.; Delta State College, H. J. Jacob.

Louisiana — University of Southwestern Louisiana, J. W. Thieret; Northeastern Louisiana State College, C. E. DePoe.

Arkansas — University of Arkansas, E. E. Dale, Jr.; Arkansas State University, E. L. Richards; Arkansas Polytechnic College, G. E. Tucker.

Tennessee — University of Tennessee, A. J. Sharp; Vanderbilt University, Robert Kral; Austin Peay State College, W. H. Ellis; University of the South, G. S. Ramseur.

Kentucky — University of Kentucky, E. T. Browne, Jr.; Murray State University, G. E. Hunter; University of Louisville, W. S. Davis; Western Kentucky University, K. A. Nicely.

West Virginia — West Virginia University, Elizabeth A. Bartholomew.

Texas — Southern Methodist University, L. H. Shinnars.

Oklahoma — Oklahoma State University, U. T. Waterfall.

Missouri — Southwest Missouri State College, P. L. Redfearn, Jr.

Illinois — University of Southern Illinois, R. H. Mohlenbrock.

Indiana — Indiana University, C. B. Heiser, Jr.

Ohio — Kent State University, T. S. Cooperrider.

Pennsylvania — Carnegie Museum, L. K. Henry; Pennsylvania State University, Carl Keener.

New Jersey — Rutgers, The State University, D. E. Fairbrothers.

The project is being supported by the National Science Foundation, and the Manual will be completed by 1975. Others interested in contributing to the project as authors of genera or unassigned families, or collectors, should contact Albert E. Radford, Chairman of the Editorial Board, University of North Carolina, Chapel Hill, N. C.

The ASB

BULLETIN

Volume 14, Number 3

July 1967



*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Harold J. Humm, University of South Florida
Retiring President — Elsie Quarterman, Vanderbilt University
President Elect — Robert B. Short, Florida State University
Vice-President — Margaret Y. Menzel, Florida State University
Secretary — Dorothy L. Crandall, Randolph Macon Woman's College
Treasurer — John Carpenter, University of Kentucky
Executive Committee — Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — W. W. Miller, III, Samford University
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Kentucky — position vacant
Louisiana — Harry J. Bennett, Louisiana State University
Maryland — position vacant
Mississippi — Joseph Fitzpatrick, Mississippi State University
North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College
West Virginia — Earl L. Core, West Virginia University

AFFILIATE

Southern Section of the American Society of Plant Physiologists

CONTENTS

Notes on Preparation for a Botanical Field Trip to Mexico. — D. R. Windler and C. R. Bell	59
Books and Periodicals	65
News of Biology in the Southeast	67

Notes on Preparation for a Botanical Field Trip to Mexico

D. R. WINDLER AND C. R. BELL

University of North Carolina at Chapel Hill

ABSTRACT.— This article presents information we hope will be helpful to people planning a botanical field trip to Mexico. Comments are made on such topics as auto permits, tourist cards, auto insurance, food and lodging, auto travel, currency, mail service, immunizations, clothing, botanical equipment and photography. Pertinent references and addresses are provided wherever possible.

A field trip to Mexico by a United States biologist who has not previously made the trip is usually preceded by gathering of information from others who have made the trip in the past. Information of this type is not usually available in print. The notes below bring together references and comments pertinent to such a trip. It is hoped that as other information becomes available additions can be made to this paper.

Auto Permits and Tourist Cards

Free auto permits, valid for 180 days, are issued at the border. The driver must be prepared to show his registration card and title of automobile ownership, or a notarized affidavit of ownership. If the owner is not in the traveling company, the driver must also present a notarized authorization from the owner.

Free tourist cards, also valid for 180 days, are issued at the border or by any Mexican consul in the United States. Proof of United States citizenship is required for issuance. In the past, fees of three to five dollars have been levied for the tourist card, but this fee has recently been abolished. (See Immunizations below)

Auto Insurance

It is most advisable to have automobiles insured while in Mexico. Since United States Auto insurance policies are not valid, insurance must be purchased from a Mexican firm. Sanborn's, with head offices in McAllen, Texas, represents the largest Mexican insurance company (largest number of claims agents) and is probably the best. In addition to their insurance they also provide an excellent travelogue on Mexican routes (See Travel Information). Information can be obtained at any of the company's offices which are located in all of the United States border towns.

Travel Information

The Sanborn's travelogue which is included with their auto insurance is probably the best available. It includes many general travel tips for the American tourist. The log keeps a running count of mileage between the larger cities and lists the names of most small towns along the route. This allows you to travel confident that you are on the right road, since road mileage and direction signs are rare. The log also lists hotels and restaurants along the routes which have been checked by Sanborn's for cleanliness, quality, and price. The American Automobile Association (AAA) puts out an excellent guide to Mexico for its members. In addition to information on hotels and restaurants, it includes information on history, industry and points of local interest. Both books are a must for the American in Mex-

ico. Another helpful booklet, *Motoring in Mexico* is offered for 25 cents by the Pan-American Union. It may be secured from: Pan-American Union, General Secretariat, Organization of American States, Washington, D. C. A book entitled *Mexico on 5 Dollars a Day* will also prove helpful in selecting low cost accommodations in some of the cities. Additional general information on Mexico can be secured by writing to the Mexican Government Tourism Department (TURISMO) at Paseo De La Reforma 35 in Mexico City, D. F.

Auto Information

In Mexico the government controls all production and sales of gasoline (Brand=Pemex). The middle and top Pemex grades are comparable to regular and premium U. S. grades and cost about the same amount. Pemex stations are well scattered throughout Mexico, but unfortunately, not all the local station operators are reliable (e.g. short change, water in gas, etc.). Sanborn's travelogue points out both reliable and unreliable stations along the routes. Service station restrooms, if provided, are frequently not as clean as would be desired but, Pemex is currently trying to upgrade them. Most major United States motor oil brands can be obtained in Mexico.

A reserve 5 gallon can of gasoline should be standard equipment on a trip. Other items which should be included as auto equipment are: a good light, a tow cable, 4 *good* tires and one *good* spare, a good jack, a tool kit and lug wrench, a shovel, an extra fan belt, spark plugs, points and a fire extinguisher.

Most cities of any size have good mechanics trained to work on the common makes of foreign and American cars. A list of automobile agencies may be found in the AAA guide. Volkswagen agencies are also quite common in Mexico and will tend to become more common after the completion of their new Puebla plant. A booklet listing all North American VW Agencies may be obtained from any U. S. VW agency.

Night driving should be avoided. A driver never knows what he will find over the next hill or just past the range of his headlights. Trucks frequently park half on and half off the highway,

cars and buses are driven at night with only parking lights, and cattle, goats and burros commonly wander onto the road. Furthermore, there may not be center lines or guard rails on potentially dangerous stretches of highway.

Mail Service

General air mail letter delivery between Mexico and the United States is good and air postal costs are similar to those in the United States (80 centavos or 6.4 cents American for up to ten grams). Due to differing customs and mail regulations of the United States and Mexico, packages (especially of biological material) are frequently held for long periods of time and are occasionally lost. If possible, have packages of biological material sent thru some Mexican academic or research institution and addressed to a similar United States institution.

Immunizations

Proof of smallpox vaccinations is required for entrance into Mexico and is also required upon reentry to the U. S. Botanists working in the field probably should take several others: Tetanus, Rocky Mountain spotted fever, Typhoid and Typhus are advised. A yellow fever vaccination is officially recommended for Guatemala. If the party plans to visit Southern Mexico, having this protection would also be advisable.

An international immunization card on which these vaccinations are listed can be obtained at public health offices and at most travel agencies. Every immunization received must be registered on the card by the administering physician and be validated by a Public Health official. This card should be carried at all times while in Mexico.

Spanish

Although it is extremely helpful to speak fluent Spanish, it is not necessary. A number of good Spanish phrase books are available and with their use most people can politely make their needs known and even engage in *simple* discussion. Some helpful pocket size books to aid in communication in Spanish are:

1. Berlitz "Spanish for Travelers"
2. Follett's "Instant Spanish"

3. Follett's "Vest Pocket Spanish Dictionary"

4. Holderman's "Let's Say It In Spanish!"

These and others are available through Sanborn's McAllen, Texas and at other book stores.

It is advisable to carry a letter from an official of your home institution, in both English and Spanish, which explains the purposes of your trip. The Spanish letter helps account for equipment and chemicals carried as you pass the several customs offices inside the border.

Food and Water

Almost any kind of food may be taken into Mexico from the United States. On an extended trip it might be wise to take a variety of canned meats, fruits and fruit juices, cookies, peanut butter, and mustard. Bread can be easily purchased in towns. Mexican fruits which can be peeled are entirely safe and are very good. As a general rule, well cooked Mexican food is safe. Any fresh food which may have come in contact with the soil should not be considered safe. Most dairy products are not pasteurized and should be avoided. Excellent food is available in Mexican Super-Mercados in the larger towns and cities. Sanborn's travelogue lists many good restaurants and gives further tips on food. When possible, it is best to follow their recommendations.

Water in Mexico is a problem mainly because of habits Americans have developed at home. All hotels have purified bottled water in the halls for drinking. This is the only water which should be consumed. Jugs may be filled in the hotel for field trips. Every person should have his own personal, well marked, plastic gallon jug and a canteen. Powdered flavoring with one of the new liquid sweeteners helps to make the frequently warm water more palatable. Bottled carbonated beverages and beers are excellent and safe, but they should be chilled in the bottle since ice is frequently made from unpurified water.

Most restaurants serve American dishes as well as the spicy Mexican foods. An abrupt change to a spicy diet may cause diarrhea which frequently leads a person to think he has contracted one of the numerous forms of dysentery.

Some guides (Sanborn's among them) recommend the constant use of a dysentery medicine. This is probably not needed and some doctors maintain that it is improper treatment. If you become ill while in Mexico, do not hesitate to see a Mexican doctor. His knowledge of tropical diseases and recommendations for treating them will probably be more reliable than that of your own physician at home.

If meals are to be eaten in the field, several other items will be useful. Among these are a compact single burner campstove, whose case doubles as a saucepan and frying pan (available through Coleman). Paper towels and large bags for refuse are also useful. (Don't be a litterbug!)

Clothing

A tendency on any type of trip is to pack more clothing than is needed, but on extended field trips "city clothes" and "field clothes" adequate for the time of year and length of stay should be included. Field clothes are not appropriate in many of the new motels and restaurants. Women's slacks and shorts are not considered to be proper attire in towns. The following list should be kept in mind when packing:

Shoes: Comfortable pair for driving and town wear

Leather boots for the field

Tennis shoes and/or moccasins

Jacket: 1, light weight

Raincoat: (A must in the rainy season) Light raincoat or poncho

Sweatshirts: 2 (one with a hood is good at high altitudes)

Bathing Suit: Many reasonably priced hotels have pools for guest use.

Laundry Bag

Hat or Cap: Mexican straw hats are cool and may be purchased for 40-80 cents (American) in the markets.

Towels: Furnished in hotels. Washcloths are rarely furnished.

Personal Equipment

Toothbrush and toothpaste: Be careful to dip your brush into a glass of purified water instead of holding it under the faucet! Tap water is *not* purified!

Tobacco: Even if you don't smoke, it may be advisable to take a couple of cartons of

American cigarettes along. American cigarettes are roughly 2-3 times as expensive in Mexico as they are in the United States and make good tips in return for services rendered.

Toilet Paper: Hotels will have it, but the consistency in quality is poor. Some should definitely be taken along.

Shaving equipment: Non-electric is the most reliable.

Plastic soap box and a number of small bars of soap

Bug bomb (to spray auto and room if needed)

Insect repellent (several bottles per person)

Alarm clock

Sun glasses

Wrist watch

Stationary

Collection Times

If the collector is working on a particular genus, the best time can frequently be determined by examination of large herbarium collections of the group. For general collections the best times would be after the end of the rainy season (October 20th-December 15) or at the beginning of the rainy season (March 15-May 1). Other dates are also acceptable, but these seem to be the peak flowering times.

Collection Regulations

A recent notice published in the ASB Bulletin (Anonymous, 1967) discusses and enumerates Mexican collection regulations. Appropriate addresses are provided from which animal and plant collection permits can be obtained.

An identified duplicate specimen of each collection should be sent to the Mexican National Herbarium at the following address:

Herbario Nacional del Instituto de Biologia
Universidad Nacional de Mexico,
Casa del Lago, Chapultepec,
Mexico, D.F., Mexico

Botanical Equipment

It is realized that personal preference and the type of research will play a large part in the choice of equipment. The check list presented below will, however, cover most needs.

Machete: A high quality machete with good leather sheath may be purchased reasonably in Mexican hardware stores.

Data Books and pencils

India Ink pen

Felt Markers

Wax pencils

Knife and sheath

Pruners

Stringed labels

Compass

Packets for fruits

Cardboard ventilators

Backs and straps for 6-8 presses

100% rag paper labels (for fixatives)

Plastic bags

String

Rubber bands

Tape measure

Shoulder pack

Blotters

Fixatives

Vials

Drying of pressed specimens can be a problem, especially during the rainy season. A car top carrier which allows air to circulate around the specimens is useful, but should not be the only means available. A method which has been shown to be effective is one in which a 3-foot plant press is placed against a wall of the room with the narrow side toward the wall. A small electric room heater (1200 watts) with a fan is then placed along the wall so that it blows toward the open end of the cardboard corrugations. Two four foot poles or sticks are then placed from the top of the press to the top of the heater. A tarp stretched over the frame work forms a wind tunnel. The distance between the heater and the press should be adjusted so that a slow drift of warm air can be felt at far side of the press. An extension cord (heavy duty, 20' long) is often necessary. Other driers are discussed in "Manual for Tropical Herbaria" which is offered for sale by the International Association for Plant Taxonomists, Utrecht, Netherlands.

After the specimens are *dry* they may be tied securely between two cardboards and placed in large plastic bags (garbage can liners, Sears & Roebuck). The bags, once sealed, can then be placed inside cardboard boxes. The plastic bags will keep specimens protected from moisture and insects.

If the plants are to be mailed back to the U.S., masking tape and wrapping paper will also be needed as part of the supplies. Air freight is considered to be the safest way of sending the specimens back to the United States. If mailing specimens is contemplated, pack expendable

materials in boxes of a size which can be used to ship specimens.

Books

There are currently few books on the Mexican flora. Stanley's *Trees and Shrubs of Mexico* (1920-6) is probably the single major work on Mexico. The completed portion of the *North American Flora* also includes Mexican plants (Britton, 1905-). Pesman's *Meet Flora Mexicana* (1962) is keyed to a popular audience, but is worthy of examination. It contains a vegetation zone map reprinted from a paper by A. Sarker Leopold (1950). Either this map or the one in the original publication will aid in understanding the general lay of vegetation and may help in planning a trip. A book, only recently published, on the flora of the Misantra region of Veracruz (Spanish) by Arturo Gomez-Pompa (1966) would be helpful in that region. It is encouraging to learn that the National Herbarium of Mexico has undertaken the development of a flora of the coastal state of Veracruz and currently has a number of full time collectors in the field. A good source of references on Mexican botany has recently been compiled by Ida Kaplan Langman (1964). Article titles are arranged by years under the author's name. The index includes plant names, authors and localities. Several additional books and references are listed under Literature Cited at the end of this paper.

First Aid Supplies

Most large towns have a hospital, but it is nevertheless wise to carry some first aid supplies. The list below suggests possible items which could be included:

<i>Aspirin</i>	<i>Snake-bite kit</i>
<i>Chapstick</i>	<i>Antiseptic</i>
<i>Band-aids and bandages</i>	<i>Salve for burns</i>
<i>Adhesive tape</i>	<i>Halozone tablets for water</i>
<i>Gauze</i>	<i>Matches</i>
<i>Cotton</i>	<i>Scissors and tweezers (forceps)</i>
<i>Eye cup and bath</i>	<i>American Red Cross</i>
	<i>First Aid Manual</i>

If a prescription can be acquired from a doctor, it may be wise to get some strong pain pills to relieve pain till you can get to a doctor with

broken bones, etc. These items may be stored in an "army surplus" ammunition box which is watertight and usually inexpensive.

Photography in Mexico

Camera equipment brought into Mexico may include one still and one movie camera per person with 12 rolls of film for each camera. Film should be purchased in the U.S. since the Mexican cost is roughly double that of the U.S. list price. It may be advisable to carry the film in an insulated air tight case with a drying agent to protect it from the high heat and humidity in some of the tropical regions, or to buy film specially packed for the tropics. Other equipment that might prove helpful are extra lenses, a light meter, a tripod, a lens brush, and lens tissue. A booklet, available from Eastman Kodak Company, entitled *Notes on Tropical Photography* (Kodak Service Pamphlet #c-24) is helpful.

Sending exposed film to U.S. developing plants from Mexico by mail is not recommended. U.S. visitors frequently keep all exposed film with them and have it developed after returning to the United States. Good, reasonable processing services are available in the larger cities, and should be used on extended trips.

United States Plant Importation Permits

Pressed dried specimens or fixed material enters the U.S. without a permit. All soil, however, must be removed from the roots. Permits and regulations governing the entry of seed and cuttings may be obtained from:

Agricultural Research Service
Plant Quarantine Division
209 River Street
Hoboken, N.J. 07030

Camping

Although open air camping is not recommended, it is possible to camp in many parts of Mexico and a few camping trailer camps are being developed. A book entitled *Mexico Auto Camper and Trailer Guide* is available from Sanborn's for \$3.50. Another entitled *Trailer in Mexico* is sold by Trail-R-Club, Box 1376, Beverly Hills, California 90213 for \$2.75.

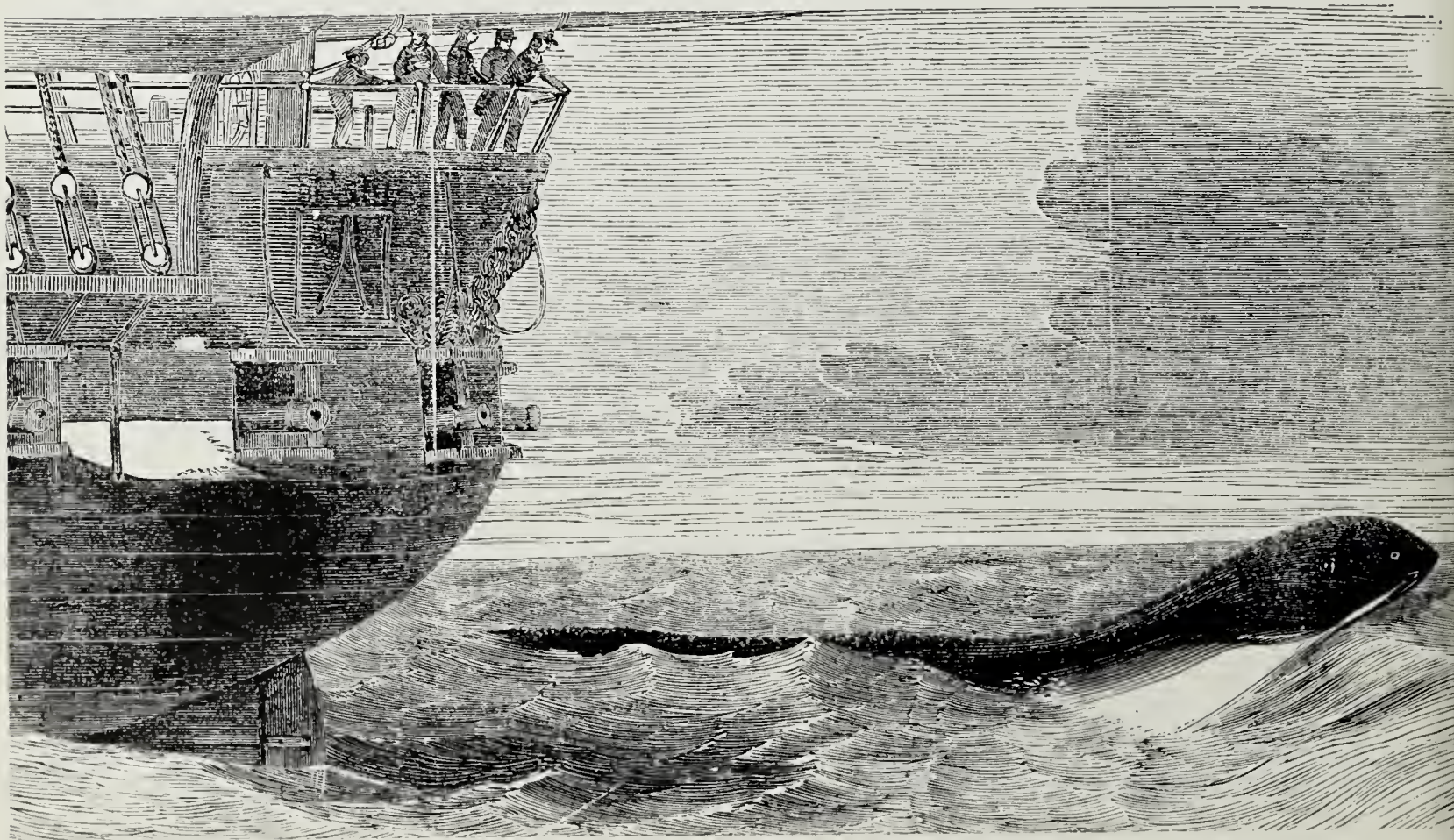
Cost of Trip

Cost varies with the group making the trip and the vehicle used. Living in moderation, it is possible for several people to make the trip for an average of 5 to 6 dollars per person per day for food and lodging. Living in expensive hotels and eating in the very best restaurants will raise this figure substantially, whereas, camping would reduce the cost. The extra time required to make and break camp must be weighed against the time available for the botanical work.

LITERATURE CITED

- Anonymous. 1967. Regulations for collecting in Mexico. *ASB Bulletin*, 14:10-11.
- Bartram, E. B. 1949. Mosses of Guatemala. *Fieldiana: Botany*, 25:1-442. Chicago.
- Britton, N. L., et al. 1905-. *North American Flora*. New York Botanical Gardens.
- Fosberg, F. R., and Marie-Helene Sachet. 1965. Manual for Tropical Herbaria. *Regnum Vegetabile*, 39:1-132.
- Gentry, H. S. 1942. *Rio Mayo Plants*. Carnegie Institution of Washington Publication 527. 328 pp.
- Gomez-Pompa, A. 1966. *The Flora of the Misantha Region*. Instituto Mexicano de Recursos Naturales Renovables, A. C., Dr. Vertiz 724, Mexico D. F.

- Langman, Ida Kaplan. 1964. *A Selected Guide to the Literature on the Flowering Plants of Mexico*. Univ. of Pennsylvania Press, Philadelphia. 1015 pp.
- Leopold, A. S. 1950. Vegetation Zones of Mexico. *Ecology*, 31:507-518.
- O'Gorman, Helen. 1961. *Mexican Flowering Trees and Plants*. Ammex Asociados, Mexico, D. F. 228 pp.
- Pesman, M. W. 1962. *Meet Flora Mexicana*. Dale S. King, Publisher, Six Shooter Canyon, Globe, Arizona. 269 pp.
- Standley, P. C. 1920-26. Trees and Shrubs of Mexico. *Contrib. U. S. Nat. Herbarium*, 23:1-1721 (In five parts). Available from Johnson Reprint Corp., 111 Fifth Ave., New York 10003.
- Standley, P. C. 1930. Flora of Yucatan. *Field Museum of Natural History, Botanical Series*, 3:1-492. Chicago.
- Standley, P. C., and J. A. Steyermark. 1946-1958. Flora of Guatemala. *Fieldiana: Botany*, 24: parts I, III-VI. Chicago.
- Standley, P. C., and L. O. Williams. 1961-3. Flora of Guatemala. *Fieldiana: Botany*, 24: part VII:1-570. Chicago.
- Swallen, J. R. 1955. Grasses of Guatemala. *Fieldiana: Botany*, 24: part II:1-390. Chicago.
- Wilcock, J. Yearly editions. *Mexico on Five Dollars a Day*. Arthur Frommer, Inc., 80 Fourth Ave., New York.



Books and Periodicals

SPORES: THEIR DORMANCY AND GERMINATION, by Alfred S. Sussman and Harlyn O. Halvorson. 1966. Harper & Row, New York. XI + 354 pp. \$14.00.

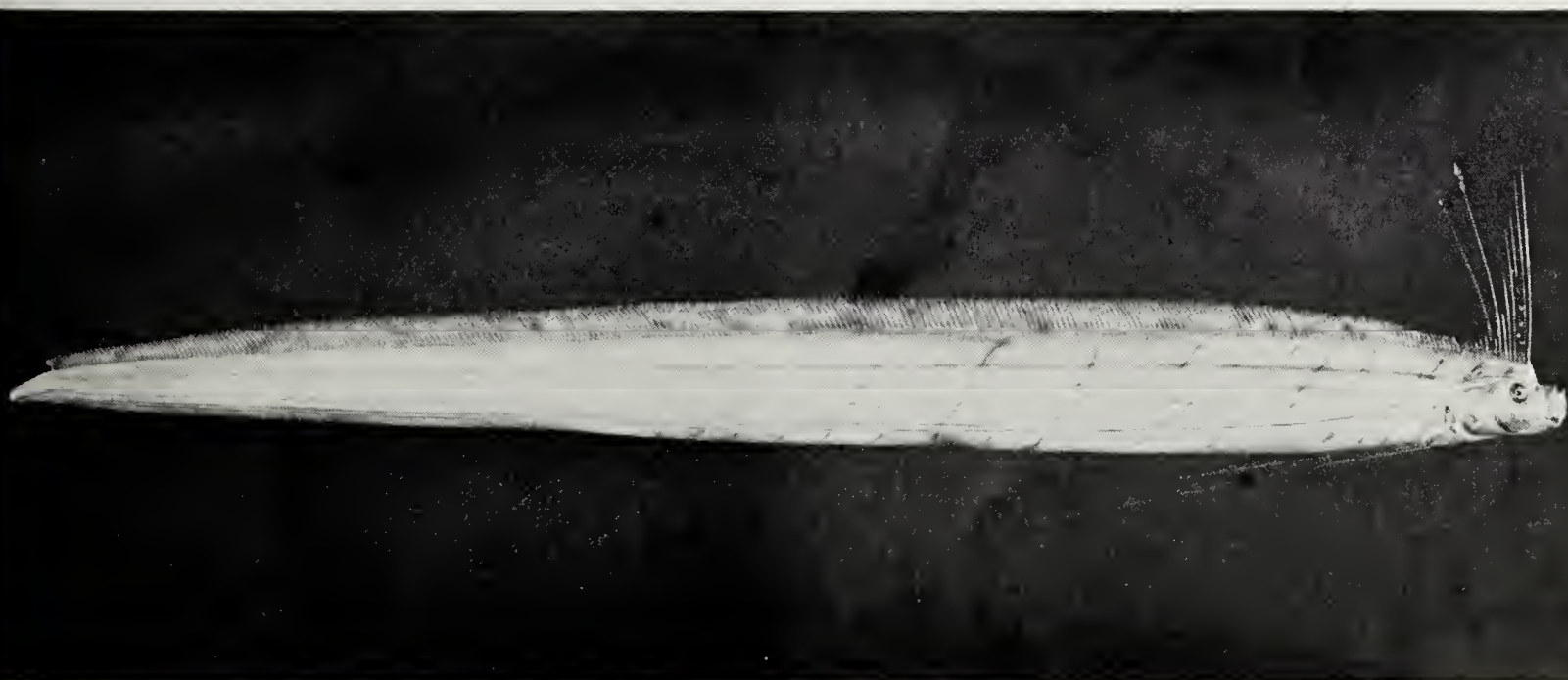
The authors' choice of the spore as a model system for a discussion of dormancy is based on several factors, such as the uniqueness of the spore as both an end point and a beginning in a biological system, the practical importance of the spore in such areas as food preservation and pathology, and actual data available on the subject. The authors state that, "To retain an historic as well as introspective analysis, this book is largely restricted to discussions of dormancy in microbial systems in which biochemical aspects have been analyzed in some detail." It is, perhaps, not surprising that references to *Neurospora* and *Bacillus* predominate, especially in view of the authors' personal interests and investigations in these genera. Their long acquaintance with problems of dormancy in microorganisms well qualifies them to write a book on the subject.

Mechanically, this book is excellent. The format is attractive and the text is well written. A few typographical errors are present but they do not detract from the text. There are numerous graphs and illustrations, including electron micrographs of uniformly high quality. Many of the data compiled from the literature, such as factors affecting spore germination, and longevity of spores, are presented in the form of tables, for easy comparison of species. Previously these data were available only in scattered publications. A list of references concludes each chapter. For the 11 chapters in the book there are 1,778 references, including duplications.

To the applied biologist the most useful feature of this book may well be the compilations of data on the influence of various factors on spore germination and survival. These will enable the worker interested in germinating a troublesome fungal or bacterial spore to readily find the information he needs. References are also provided for all of the information in each table. It is unfortunate, however, that no index is provided to the genera of organisms mentioned. Such an index would have facilitated its use as a reference book. Another minor, but annoying, omission is the lack of titles of publications in the references. While it may seem sufficient to give only the author and source for an article, it must be remembered that there are many who do not have ready access to great libraries such as those at Michigan and Wisconsin. This is especially true of our colleagues in foreign countries. Such publications must be obtained on microfilm, but this requires knowing the title of the article desired. Authors Sussman and Halvorson will no doubt be willing to furnish this information when necessary.

In summary, this book represents an excellent monograph on the subject of spore dormancy and germination, and will be essential reading for anyone interested in this subject. It would seem, however, that the almost total lack of references to organisms other than fungi and bacteria will prove disappointing to workers in other fields, such as zoology. If this book is to truly serve as a reference work on basic principles in biological dormancy, it would seem worthwhile to have included at least a chapter stressing the parallels between dormancy mechanisms in microorganisms and other organisms, such as higher animals. The authors chose, however, to leave this to the individual reader.

— RICHARD T. HANLIN, *University of Georgia*.



ZOONOSES. Edited by J. Van der Hoeden. Elsevier Publishing Company, Amsterdam, London, New York. 774 pp. 1964. \$40.00.

The opening line is a quotation, "Zoonoses are those diseases and natural infections which are naturally transmitted between vertebrate animals and man." This is taken from the Second Report of the Joint World Health Organization/Food and Agriculture Organization Expert Group on Zoonoses, 1958.

The Introduction gives some definitions and indicates the character of the information to follow. Because of the enormous amount of knowledge on the zoonoses recently acquired, limitations of materials are necessary. Only essential historical information is included; diagnostic and therapeutic methods and systems are not described in detail. Most emphasis is placed on the discussion of epidemiological problems, comparative nosology, and preventive medicine. Some diseases, rare in man, or of questionable transmissibility to man, are omitted.

There are 21 contributors to the book distributed by countries, as follows: Israel, 10; The Netherlands, 9; Belgium, 1; and the United States of America, 1.

The subject matter is divided into 7 chapters, viz.: Bacterial Diseases, Rickettsial Diseases, Viral Diseases, Fungal Diseases, Protozoal Diseases, Zooparasitic Diseases, and Diseases of Man Transmissible Through Animals. There are 110 figures in the text which are helpful in illustrating various aspects of the diseases being described.

The material is presented in a lucid and readable manner. Readers in the Western Hemisphere may be impressed by the relative emphasis upon these diseases in Europe as compared to the rest of the world. On the whole, however, the information presented appears to be fairly well-balanced.

There is considerable inconsistency in the presentation. As an example, in the discussion on toxoplasmosis, no mention was made of treatment, although with some other diseases of much less importance in man, some of the drugs used for treatment are mentioned.

There is a large distracting number of misspellings. Perhaps one of the most disturbing features to the serious reader is the inconsistency in the handling of the references. Often references in the text are not shown under references cited at the end of the chapter, while some of those listed at the end are not cited in the text. There is also much irregularity in the manner of listing the references. Sometimes the author's initials are omitted, the same names are handled differently in different parts of the text, and only one or all of the authors of a paper might be shown. There are also errors in listing the volume numbers of the journals shown.

This book contains much information of interest concerning zoonoses. However, the numerous errors and inconsistencies do not recommend it as a reference. — MARTIN D. YOUNG, Sc.D., *Gorgas Memorial Laboratory*.

PRINCIPLES OF MICROBIAL ECOLOGY. Thomas D. Brock. Prentice-Hall, Inc., 1966. 306 pp., \$7.75.

This is an exciting book with a unique and original approach. Concepts and results from a wide assortment of disciplines are applied to various ecological problems in a stimulating and thought-provoking fashion. It is, I suppose, inevitable that each reader will find some of his favorite papers on microbial ecology are missing. However, one is also equally likely to find papers that one really should have read and somehow missed reading.

The first three chapters (Introduction, The Microbial Environment, and The Ecology of the Cell) furnish essential background material though not in depth. The short chapter (4) on dispersal contains some of the recent results on mechanisms involved but little discussion of the ecological consequences. The chapters (5 thru 9, pages 89-289) on populations and population interactions make up the bulk of the text and represent a most original analysis of ecological problems. Brock has explored many areas not covered in "The Biology of Populations" by MacArthur and Connell also published in 1966.

I was particularly pleased with the discussion of population interactions which digests and relates a substantial body of comparatively recent information. Many of the papers discussed conflict with established dogma and it is especially important that a unified, balanced analysis of microbial ecology be available at this time as a foundation for future research in this important field. — JOHN CAIRNS, JR., *University of Kansas*.

THE COCCIDIAN PARASITES (PROTOZOA, SPOROZOA) OF RODENTS. Norman D. Levine and Virginia Ivens. Illinois Biological Monographs No. 33, University of Illinois Press, Urbana, 1965. 365 pp. \$7.50.

Since most parasitologists and protozoologists are already aware of this excellent monograph, this review is directed toward those in other biological disciplines who also serve on library committees. This important volume should be in every well-balanced biology library. It contains 47 plates with 443 figures which supplement detailed species descriptions so well that any microscopist should be able to use this as a working reference. Available data on the geographic distribution, pathogenicity, cross-transmission studies, and prevalence is also given. For a publication likely to be subjected to frequent laboratory use, it is rather surprising that the binding and cover were not made of more durable materials. — JOHN CAIRNS, JR., *University of Kansas*.

News of Biology in the Southeast

About People

Ralph D. Amen, Assistant Professor of Biology, Wake Forest College, Winston-Salem, North Carolina, has been promoted to associate professor and appointed chairman of the Department of Biology at Wake Forest. Both appointments are effective July 1, 1967.

Newton E. Kingston, Geneva College, Beaver Falls, Pennsylvania and **Lewis A. Follansbee**, Orange Coast College, Costa Mesa, California, received Academic Year Extension Grants under the Research Participation for College Teachers program of the National Science Foundation to continue their work during the next year and a half. The grant from the NSF is \$2,000 for each investigator. Both are associated with the Virginia Institute of Marine Science, Gloucester Point.

The University of Virginia has awarded grants totaling \$9,385 to three Virginia Institute of Marine Science, Gloucester Point, investigators: **M. N. Nichols**, Head of Geological Oceanography Department; **Frank Perkins** of the Microbiology-Pathology Department; and **Kenneth L. Webb** of the Environmental Physiology Department, who are also members of the faculty of the Department of Marine Science of the University of Virginia.

Margaret Peaslee joined the Biology faculty of Florida Southern College, Lakeland, in September, 1966, as Assistant Professor after receiving her doctoral degree at Northwestern University in Animal Physiology. **Carla Huddleston**, Assistant Professor of Biology, has been granted educational leave to return to Northwestern University to complete her doctoral degree in Cellular Physiology.

Robert A. Pedigo, formerly Associate Professor of Biology, College of William and Mary, Williamsburg, has accepted a position at St. Andrew's Presbyterian College, Laurinburg, North Carolina.

Beryl C. Franklin, Associate Professor of Biology, Northeast Louisiana State College, Monroe, is the 1967-68 President of the Louisiana Academy of Sciences.

Alan G. C. White, formerly Professor of Biochemistry, Tulane University, New Orleans, will become Professor and Head of the Department of Biology, Virginia Military Institute, Lexington, on 31 August 1967.

Leslie L. Ellis, Professor of Zoology, Mississippi State University, State College, has been appointed Editor of the *Journal of the Mississippi Academy of Sciences* succeeding **Walter Abbott**, Senior Biologist, Gulf Coast Research Laboratory, Ocean Springs, Mississippi. A major revision of editorial policies will result in the appointment of a board of Associate Editors.



Walter K. Taylor has been appointed Assistant Professor of Zoology, Mississippi State University, State College, effective September, 1966. He received his doctorate from Arizona State University in Zoology, specializing in Ornithology.

In January and March **William D. Burbanck** participated in two regional conferences on the International Biology Program in Washington, D. C. at the National Academy of Sciences. The international program will operate from July 1967 to June 1972.

William D. Burbank will be on leave from the Biology Department of Emory University during the spring quarter. He and Mrs. Burbank (Dr. Madeline P.) will spend five months at Woods Hole, Massachusetts continuing their research on the isopod *Cyathura*.

Martin D. Young, Director, Gorgas Memorial Laboratory, Panama, Republic of Panama, has received a grant from the U. S. Army Research and Development Command, to determine if human malaras will grow in Panama monkeys. James A. Porter, Jr., has joined the project as co-investigator.

Martin D. Young, Gorgas Memorial Laboratory, Panama, R. P., has been appointed Visiting Professor of Epidemiology, Alabama Medical Center, and a member of the Malaria Commission, Armed Forces Epidemiological Board, Washington, D. C.

Greensboro College announced that the Research Committee of the College had awarded two grants-in-aid in the biological sciences. Kemper Callahan was made an award to continue his studies on virus-infected elm pollen, the results of which may have broader applications in forest pathology. Arnold Van Pelt was recipient of funds to continue his studies on a hairloss mutant in mice, a condition which past studies have shown to imply a hormonal imbalance.

Herbert P. Riley of the University of Kentucky has been appointed Visiting Professor at the University of California, Irvine, for the academic year 1967-1968. This appointment is for one year, after which Dr. Riley will return to the University of Kentucky.

J. Frances Allen, formerly with the National Science Foundation, has recently become Chief, Water Quality Requirements Branch, Federal Water Pollution Control Administration, Washington, D. C.

About Institutions

A consortium of 13 private colleges of the Mid-Appalachian region (Mid-Appalachia College Council, Inc. — MACCI) is establishing a Field Biology Teaching and Research Center on Norris Lake in Campbell County, Tennessee. The first class is to be given at the Center this Summer. A. Randolph Shields, Chairman, Biology Department, Maryville College, Maryville, Tennessee, is the Director.

A new science building is under construction at Maryville College, Maryville, Tennessee. The two-story building will house Biology, Psychology, Chemistry and Physics. The biology quarters diverge from the standard laboratory setup by providing individual work areas for upperclassmen and audio-tutorial facilities for lower level courses. General Biology has been eliminated from the curriculum.

The Science Department, Methodist College, Fayetteville, N. C., recently received a matching fund grant of \$14,205 for the purchase of instructional scientific equipment from HEW. Ten years after being chartered by the State of North Carolina and after seven years of operations, Methodist College was recently granted full accreditation by the Southern Association of Schools and Colleges.

William J. Hargis, Jr., Director of the Virginia Institute of Marine Science, Gloucester Point, has announced that the Old Dominion Foundation has awarded the Institute a grant of \$10,000 to expand its oceanographic library.

An Hitachi HU-11-B-1 Electron Microscope has been recently installed in the Microbiology-Pathology Department of the Virginia Institute of Marine Science, Gloucester Point. It will be used in the study of pathogens of marine organisms, the microorganisms themselves, and cells and tissues.

NSF has awarded grants to the Virginia Institute of Marine Science, Gloucester Point, for the conduct of a Research Participation for College Teachers program in which four post-doctoral participants will be selected. An Undergraduate Research Participation program providing research experience for ten undergraduate students and a Cooperative College-School program with the city of Norfolk for training Junior High School science teachers are also available. Information about these programs may be obtained by writing Robert S. Bailey, Director, NSF Programs, Virginia Institute of Marine Science, Gloucester Point, Virginia 23062.

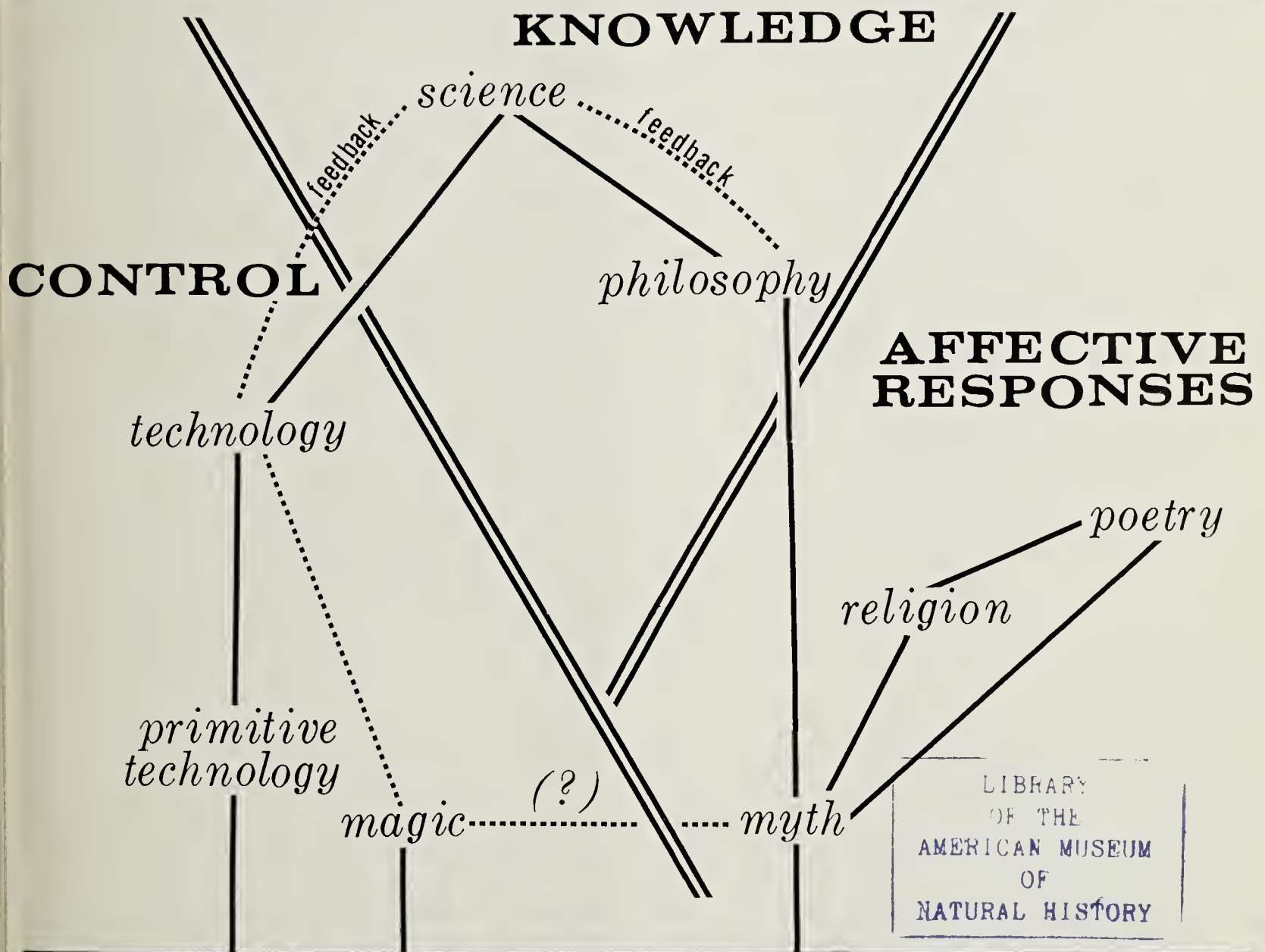


The ASB

BULLETIN

Volume 14, Number 4

October 1967



EARLY MAN VIS-A-VIS THE WORLD

(See Notes on the Natural History of Science, p. 71)

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Harold J. Humm, University of South Florida
Retiring President — Elsie Quarterman, Vanderbilt University
President Elect — Robert B. Short, Florida State University
Vice-President — Margaret Y. Menzel, Florida State University
Secretary — Dorothy L. Crandall, Randolph Macon Woman's College
Treasurer — John Carpenter, University of Kentucky
Executive Committee — Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — W. W. Miller, III, Samford University
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Louisiana — Harry J. Bennett, Louisiana State University
Mississippi — Joseph Fitzpatrick, Mississippi State University
North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggins, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College
West Virginia — Earl L. Core, West Virginia University

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman

CONTENTS

Association Affairs	70
Notes on the Natural History of Science. — Perry C. Holt	71
Letters	75
News of Biology in the Southeast	76

ASSOCIATION AFFAIRS

From the President

In order that the Association of Southeastern Biologists may have an appropriate and effective means of expressing the general feeling of the membership concerning conservation problems, a five-member committee has been appointed.

It is the duty of the new Conservation Committee to evaluate such problems, especially in the southeastern states; to express their opinion, to recommend a course of action, or to oppose an imminent action that would damage or destroy a natural area which it appears to be in the public interest to preserve. The committee is authorized to make public resolutions of their own at any time. With conservation problems of major importance on which action is not required promptly, the committee may bring the matter before the membership at the annual meeting and perhaps present a resolution for possible adoption by the ASB as a whole.

The committee will also serve as a means of communication between the Association and various conservation agencies who will thus be able to determine the viewpoint of ASB concerning current problems and, in many cases, gain the Association's support in what they are trying to do. Conversely, the Association will have an agency authorized to convey the opinion of the membership on conservation problems and proposals and

(Continued on page 78)

Notes on the Natural History of Science

Perry C. Holt

*Department of Biology
Virginia Polytechnic Institute*

Things have a way of getting all jumbled in my mind. This, I contend, is not because I'm unusually scatter-brained, but because that is the way the world is. Is my colleague my friend or my enemy? At times I don't know which he is. When does day end and night begin? What are the limits of my neighborhood? At the next street over or four and a half light-years away at the edge of the galaxy? And so on.

Such problems we try to resolve by processes of analysis, definition and classification. At present I am concerned with a cluster of problems arising from the similarities and differences between and the origins of a group of activities that man has engaged in at one time or another. These human activities are called magic, mythology, philosophy, technology and science. In discussing them, I may more or less adventitiously touch upon two others, poetry and religion. Don't be disturbed: I have neither the erudition nor the time to do more than a little elementary classification in my attempts to unjumble these things in my mind. But I am a taxonomist by trade and rather naturally, when presented with a job to do, reach for the tools of my craft.

A number of things have occurred in recent years to bring these problems to my attention. The text we use in our course in General Biology at the Virginia Polytechnic Institute in the inevitable attempt to explain to the novice scientist what it is he is about, makes the statement that science began in tribal magic. An erudite colleague objected that this was a damned lie. I, having read the anthropologist, Malinowsky, and various historians of science, was inclined to agree with the author of our zoology text. That was one thing. Then some of my reading (an issue of *Daedalus*; Tolkien) led me to wonder as to the nature and function of myth. I have always been

interested in the relationships between science and philosophy, including in the latter term both mythology and religion which in their explanatory and dogmatic aspects, at least, are proto-philosophic in nature. Practically, of course, if I'm to teach a science to our youth, it behooves me to know what science is. Thus, for several reasons, the attempt to clarify in my mind the relations, including, in part, questions of origin, between science, magic, myth and technology.

I began, as a scientist always does, with a vague and not too precisely formulated question. This in the true spirit of the scientific method was followed by tentative and not too well organized prying into various likely and unlikely corners I either already knew about or discovered, almost by accident, in the course of my prying. Such prying is usually referred to by scientists as preliminary investigations with the clear implication that they are directed by a well conceived and quite logical plan. Except for Master's theses, this is mostly not so.

One result of my investigations was that I quickly rediscovered something that I already knew: neither enough years are left to me nor enough intelligence bestowed upon me in the beginning for me to hope to learn all the archaeology, anthropology, history, philosophy and psychology, among other pertinent fields of learning, necessary for a truly scholarly solution, based upon the evidence, of my problem.

Since this paper purports to be more than a record of the failure of a project—we early learned not to report negative results—I must have decided upon something other than the *tour-de-force* of scholarship that I have implied would be necessary. What I shall do is to attempt to identify what a taxonomist would call the diagnostic characters of the objects of this study and

further, on the basis of similarities that are in perhaps more than an analogical sense homologous, work out a phylogeny, a system of relationships, for these types of human behavior. That I don't know all there is to know about such areas of study as mythology and philosophy perhaps will not completely negate my efforts: a zoological taxonomist, whose classifications may be very sound, never claims to know more than a very little of all that can be known of his animals.

To begin.

Magic. A practical art of early man aimed at controlling the "powers" of the world, both animate and inanimate, including other men.

A suggestion of John Wilson's in a book entitled "Before Philosophy" is significant for an understanding of both magic and mythology. To early man (Wilson is talking of Egyptians, but I think the idea can be safely generalized) an object in the world outside himself was a "thou", a person, with feelings, emotions and thoughts similar to his own. Persons, if one knows and says (I speak not at all metaphorically) the right words of power, can be controlled to the will of the speaker and possessor of power. This, of course, is still a matter of daily observation and must have been at the basis of the very structure of primitive society. Magic develops, on this view, then, very simply by extending the techniques, or some of them with modifications, for influencing people to the other "people" who were the rain or the sun, the hunted animals, the cultivated plants or the "Bright Ones" above all these.

Magic will be seen to share some features in common with myth. This is all right, magic and myth are species of the same genus and should be much alike.

The personal power of the "thou" of the non-human world is the "mana" of the Polynesians. American aborigines had a number of words for the same concept and modern man when he curses the stone over which he stumbles is expressing a thinned-out version of the same view.

The techniques for controlling the powers of nature, the mana of the Polynesians, need not be reviewed here. It is enough to recall the fertility rites practiced at the time of seed planting, the voo-doo doll and the pins, even such a weak survival as knocking on wood which some of you have probably done. The point is the validity of my taxonomic diagnosis: magic is a practical art aimed at controlling, cajoling and propitiating the powerful, often awesome, and frequently capricious, forces of the natural world.

Myth: stories, usually oral in transmission, sometimes written, which have for their subjects

the "thous" of the outside world, primeval ancestors, racial heroes and similar characters. Often, no doubt, told purely for entertainment, myths may, however, be recognized by their objectives as well as by their subject matter: they are most often in some sense stories of origin and hence addressed to the problem of explaining the world and how it came to be and, secondarily, they inculcate a pattern of behavior, usually by explaining why the tribe is as it is or the duties it owes to the power or powers of nature, or by example, simply holding up the behavior of the heroes as that which all should strive to follow. More succinctly, myth is primitive theology. No examples of myth will be presented here: simply take the sacred writings of any culture other than your own and the parts that are devoted to accounts of origins, explanations of the nature of the powers (divinities is the usual word) and the relationship of man to the world and its powers and you have a mythology.

Obviously, myth is related to magic in the sense that myth attempts to explain or to elucidate the nature of the powers that magic attempts to control. The method of myth is the narrative, the telling of a story; its objective is an explanation of the world, its beginnings and all that is in it. In the latter respect myth is also related to philosophy, another species of the genus.

Philosophy: a polytypic species, difficult of diagnosis. Lord Russell speaks of philosophy as the study of those important questions for which there are no empirically determinable answers. Philosophy is civilized mythology. The questions which a myth will pose vaguely and by implication are clarified and made explicit and more precise in philosophy. The answers, instead of being imaginative poetic stories, are based explicitly upon reasoned argumentation. Mythology, in general, appeals to the emotions, the affective behavior of man; philosophy purports to appeal to the intellect.

It should be noted that there is an important subspecies of philosophy, represented by Russell, Wittgenstein and some of their colleagues, which conceives its task to be the clarification of the meaning of statements and language. The only question considered in their philosophy is "What does it mean to say 'such and such'?" This paper is a rather weakly and presumably non-viable specimen of this subspecies.

Another subspecies of philosophy is what is more properly, perhaps, called methodology, a study of the rules or principles for the practice of an art. A common example is the "philosophy of education" as a subject taught in teacher's college. Of course, philosophy, in the sense of the nomi-

nate subspecies, is not taught in such a course. And, if there are other subspecies of philosophy, I shall not deal with them here.

The typical method of philosophy is dialectic: talking, one hopes, logically. In some forms of philosophy this has been reduced to elaborate symbolisms such as those known as mathematics and symbolic logic. The objectives of philosophy have been stated: they are derived from those of myth, as Cornford has shown in "From Religion to Philosophy".

Philosophy is related on the one hand to mythology and religion; on the other hand to science. It differs from both most strikingly in method. Philosophy uses dialectic instead of the narrative-poetic method of myth and the empirical methods of science.

Technology: thought by some, for instance, engineers and agriculturists, to be a subspecies of science, but here considered as a separate species, is the total complex of man's manual skills, that is, the use of hands, tools and machines to manipulate and control natural objects for utilitarian purposes. Though technologies may be based, as is medicine, upon complex sets of principles and theories, they are always practical and the goal is always some improvement of the material conditions of human life.

Technology began when man first began to use tools, by neolithic times it was well developed. It has always been based upon experience and common sense and may well demand the most difficult thinking man is capable of. A savage would consider you more than stupid if you suggested that magic alone, no matter how powerful, would insure a good crop of yams with no regard to seasons, weather, protection from pests, etc., matters in which the neolithic farmers were quite skilled.

Technology is related to magic in its objectives: it is utilized for the control of objects that experience has taught man he can control with his hands and tools. Technology is related to science in its methods which are fundamentally the same. This has led to confusion. There was no science until the empirical methods of technology were systematically used in pursuing the objectives of philosophy.

Science: my diagnoses of magic, myth, philosophy and technology, while not original in any true sense, are couched in my own words. But a better taxonomist than I has recently defined science. I quote George Gaylord Simpson: "Science is an exploration of the material universe that seeks natural, orderly relationships among observed phenomena and that is self-testing."

The questions of science, or the aims of science, are in part those of philosophy: science would answer all the questions about the world that can be answered on the basis of empirical observations. The motives of the scientist are the same as those of the philosopher: as complete a knowledge as possible of things as they are. The methods of science are those of technology, which accounts, perhaps, for why the agricultural technologist across the hall from me claims to be a scientist. There is, of course, no reason why a man cannot be both a technologist and a scientist, sometimes applying the methods common to both fields for purposes of control, sometimes for the purpose of acquiring knowledge about the world.

Something more should be said about the methods of science. I rely again upon Simpson. First, in spite of Francis Bacon, Karl Pearson, innumerable physicists and James Conant, there is no one method. In general, observations are made that raise a question about general ideas, relationships and interrelationships among phenomena. A tentative answer is formulated that is testable. The tests may be of quite different types, but they must be, in principle at least, repeatable by any competent observer and the more of them there are the more confidence is placed in the tentative answer that we can now call a theory or principle. It is to be noted that the tests of a hypothesis are not necessarily experiments and that nothing is said about prediction. Experiments may constitute strong tests and predictions based on a hypothesis that are fulfilled are powerful, but not necessarily, conclusive, support for the hypothesis.

Science, briefly characterized as to aims and methods, is seen to be most closely related to philosophy, particularly to the philosophy of the ancient Greeks which has been misidentified as science by most writers up to now. There was really no science until the modern period, no science in Babylonia or, Egypt or Greece or medieval Europe, though most historians of science have said so in their descriptions of ancient and medieval technologies. There were, of course, precursors ("mutations") in the ancient and medieval worlds in the unsystematic recognition by a few philosophers of the possibilities for philosophy of empirical verification.

Science differs from philosophy in that the materials of science, the phenomena about which questions are asked are just that, materials, observable, tangible objects, and in the methods which are more nearly allied to those of technology than to the dialectic of philosophy. Which, however, is not to deny that science has inherited, as part of its methods, perhaps, its use of model

building and deductive logic from philosophy. Science began when the craftsmen of the late Middle Ages taught the philosophers a surer method than dialectic for answering real questions about real things. It didn't begin until then and it is only in our lifetime that it is escaping from the paternal dominance of its father.

My limited little task is complete. It was to state what is in effect a taxonomic hypothesis. Many of the concepts upon which it is based are derived from Simpson. My erudite colleague is right and the author of our freshman text wrong.

To summarize that hypothesis as taxonomists often do, I present a phylogenetic tree (cover) showing the relationships of magic, myth, philosophy, technology and science. Keep in mind that there is a great unity here, all of these are activities of a single species (in the true zoological sense) of an animal. Certainly, early man did not compartmentalize his life. He was not a magician on Monday, a farmer-technician on Tuesday, a philosopher at some other time, a scientist at another who practiced his religion on Sundays. At all times he did more or less all these things.

Myth arose from the confrontation of man with the powers (which he thought of, in the only terms

he knew, as personal) of nature and an attempt to explain them.

Magic was a supplement to technology; a method of control. It has survived in religious ritual and popular superstition, but has proved sterile as a progenitor of other forms of behavior (culture) or thought. It is, like the sponges, an evolutionary *cul-de-sac*, a blind alley.

Philosophy arose when the critical intellects of the Ionian Greeks could no longer be satisfied with the theology which had developed from the primitive Indo-European mythology. Philosophy was their attempt, using the resources of their minds to the fullest, to answer questions about the nature and relations of phenomena.

Religion and poetry I pass over; subspecies of myth, I think, but the problems here are great and they hardly enter into the phylogeny of science.

My phylogenetic tree is botanical in a metaphorical sense; the sort of hybridization that the botanists are familiar with has occurred. Or to use the German expression, science is a bastard whose parents were technology, the elderly mother, earthly of the earth, and heavenly philosophy, aspiring to the secrets of the universe. The aspirations of the offspring are those of the father; the hands — the methods — are those of Martha.



Letters

I showed your paper to a couple of people here at the Museum — and a very lively, almost heated, discussion was the result. Like in so many things both extremes are impractical and the truth lies in the middle. It is very good that you started this action and pointed out the many stupid and senseless abbreviations that are being used. Personally I feel that one could abbreviate the title of a periodical, but should try not to abbreviate words. The title of our journal: "Zoologische Mededelingen uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden" is too cumbersome for repeated citation, but if cited "Zoologische Mededelingen, Leiden," no mistake is possible.

Abbreviations for words that are very similar (Annales, Annals, Annali, Annalen, Analele, Annuaire, Annuario; Nature, natural, national, etc.) cause endless trouble. It would be much easier to have them all written out in full. An abbreviation, if used, should be such that even outsiders cannot mistake its meaning. J. for Journal is senseless with words around like Jorنال, Jahrbuch, Jahresbericht, etc. Journ., which I use myself, also is absurd, as it saves only one letter. On the whole (with the restrictions just pointed out) I agree with you, but do not know whether it is not too late for me to switch over with my card file — which in the course of time has become quite extensive, and is consistently abbreviated.

L. B. HOLTHUIS
Rijksmuseum van Natuurlijke Historie
Leiden, Netherlands

The above letter refers to an article, "Literature Citation Abbreviations — A Waste of Time," by C. W. Hart, Jr. and Betty Ursomarso, that appeared in *The ASB Bulletin*, 11(3): 71-73. Reprints of this article are available on request from the editor of the *ASB Bulletin*.—Ed.

The only criticism I have of the *ASB Bulletin* is the lack of identification of the wonderful old engravings in recent issues — e.g. 14: #3 July '67, page 64. Even without captions these have been put on our bulletin board and have been admired.

JANE C. BELCHER
Sweet Briar College

I noticed on pages 64 and 65 of the July, 1967, *ASB Bulletin*, pictures of a "sea serpent" and an oarfish. Neither picture is accompanied by a caption, and I can find no word of explanation in the *Bulletin*. This lack of identification and/or explanation seems strange in a scientific journal.

We are involved in a study of oarfish, fourteen of which have been washed ashore on the lower west coast of Florida during the past several years. I would like to know the *source* of your picture, and if the original picture is in color. This would help us tremendously in our research.

CARL R. KEENER
Manatee Junior College

The old engravings referred to appeared as space fillers in the *ASB BULLETIN* in both the April and July, 1967, issues. The oarfish appeared in the July, 1967, issue. All had originally been published accompanying an article, "Do Sea Monsters Exist?" by Dana M. Slaymaker, that appeared in *FRONTIERS* magazine in October, 1966 (vol. 31, no. 1, pp. 4-8). *FRONTIERS* is published by the Academy of Natural Sciences of Philadelphia. The old engravings came from various volumes in the Academy's library; the oarfish picture is from the American Museum of Natural History, but I do not know if the original was in color or where the specimen was from. The illustrations were intended only as space fillers, and I apologize for not giving due credit to the source of the illustrations. —Ed.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Act of October 23, 1962, Section 4109, Title 19, United States Code)		Publisher: File two copies of this form with your postmaster	Form Approved Budget Bureau No. 46-8029
1. DATE OF FILING 29 Sept. 1967	2. TITLE OF PUBLICATION The ASB Bulletin		
3. FREQUENCY OF ISSUE Quarterly (January, April, July, and October)			
4. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, city, county, state, ZIP code) Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103			
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) Dept. of Zoology, Univ. of Kentucky, Lexington, Ky. 40506 (Dr. John Carpenter)			
6. NAMES AND ADDRESSES OF PUBLISHER, EDITOR AND MANAGING EDITOR			
PUBLISHER (Name and address) The Association of Southeastern Biologists, Inc., Chapel Hill, N.C.			
EDITOR (Name and address) C. W. Hart, Jr., Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103			
MANAGING EDITOR (Name and address) none			
7. OWNER (If owned by a corporation, its name and address must be stated and immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.)			
NAME Association of Southeastern Biologists, Inc.		ADDRESS Chapel Hill, N.C. (Dr. William J. Koch, Associate Professor, Dept. of Botany, Univ. of North Carolina, Agent.)	
8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If there are none, so state)			
NAME none		ADDRESS	
9. Paragraphs 7 and 8 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. Names and addresses of individuals who are stockholders of a corporation which itself is a stockholder or holder of bonds, mortgages or other securities of the publishing corporation have been included in paragraphs 7 and 8 when the interests of such individuals are equivalent to 1 percent or more of the total amount of the stock or securities of the publishing corporation.			
10. EXTENT AND NATURE OF CIRCULATION		AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	SINGLE ISSUE NEAREST TO FILING DATE
A. TOTAL NO. COPIES PRINTED (Net Press Run)		1400	1400
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES		none	none
2. MAIL SUBSCRIPTIONS		900	936
C. TOTAL PAID CIRCULATION		900	936
D. FREE DISTRIBUTION (including samples) BY MAIL, CARRIER OR OTHER MEANS		300	335
E. TOTAL DISTRIBUTION (Sum of C and D)		1200	1271
F. OFFICE USE LEFT-OVER UNACCOUNTED, SPOILED AFTER PRINTING		200	129
G. TOTAL (Sum of B, C, D, E, F) — should equal net press run shown in A		1400	1400
I certify that the statements made by me above are correct and complete			
		(Signature of editor, publisher, business manager, or owner) C. W. Hart	

News of Biology in the Southeast

About People

William W. Miller, III, has been appointed Associate Professor of Biology, Northeast Louisiana State College, Monroe. He was formerly at Samford University, Birmingham, Alabama.

Thomas F. Rediek, Professor of Biology, Frostburg State College, Frostburg, Maryland, is using the facilities of the Radiobiological Laboratory, U. S. Fish and Wildlife Service, Beaufort, North Carolina, for a summer project involving the primitive circulation of the tunicates.

Joseph W. Angelovic, Radiobiological Laboratory, U. S. Fish and Wildlife Service, Beaufort, North Carolina, was appointed to the Executive Committee of the Atlantic Estuarine Research Society.

Paul M. Patterson, Chairman of the Division of Natural Sciences and Mathematics and Chairman of the Department of Biology, Hollins College, Virginia, retired May, 1967, after 33 years of service. He will continue his professional activity in the position of Professor of Biology at Methodist College, Fayetteville, North Carolina.

Alice Louise Bull, Associate Professor of Biology, Hollins College, Virginia, has been appointed Chairman of the Department of Biology.

Charles Morlang, Jr., has been appointed Associate Professor of Biology, Hollins College, Virginia. He received his Ph.D. from Columbia University and his research involves problems of fern development and hybridization.

Kathleen Klimkiewicz has been appointed Instructor in Biology, Hollins College, Virginia. She received her B.S. and M.S. from Radford College and has research interests in mammalogy and ornithology.

Edward G. Roberts, Professor of Forest Production, Mississippi State University, State College, has received a grant from the National Park Service to locate and check validity of areas which have been reported as unique in some ecological or geological respect. A "Registry of Natural Landmarks" is maintained by the National Park Service of such areas.

Floyd Scott, Lloyd Scott, and Eugene Wofford have all been appointed Instructors in the Department of Biology, University of South Alabama, Mobile. All received their B.S. and M.A. (Ed.) from Austin Peay State University, Clarksville, Tennessee. Mr. F. Scott was trained in the field of herpetology and Mrs. L. Scott and Wofford were trained in plant taxonomy.

Perry C. Holt, Professor of Biology, Virginia Polytechnic Institute, Blacksburg, is spending the current academic year at the United States National Museum, Washington, D. C. This is made possible by a Senior Investigator Fellowship from the Smithsonian Institution.

Among the 25 biologists participating in the recent Smithsonian Institution Summer Institute in Systematics were the following Southeastern biologists: **Jack H. Esslinger** and **Alfred E. Smalley**, Tulane University, New Orleans; **J. F. Fitzpatrick, Jr.**, and **Leon W. Hepner**, Mississippi State University, State College; **John R. Hol-**

singer, East Tennessee State University, Johnson City; **John D. McCrone**, University of Florida, Gainesville; **Glen E. Woolfenden**, University of South Florida, Tampa; and **Ralph W. Yerger**, Florida State University, Tallahassee. Co-directors were **Robert P. Higgins**, Wake Forest University, Winston-Salem, North Carolina, representing the American Society of Zoologists, and **Ellis L. Yoehelson**, U. S. Geological Survey, Washington, D. C., representing the Society of Systematic Zoology. **Richard S. Cowan**, Head, Office of Systematics, Museum of Natural History, acted as host for the Smithsonian Institution. The Institute was supported financially by NSF, USAF Office of Research and the Smithsonian Institution.

C. W. Hart, Jr., and **Dabney Hart**, Academy of Natural Sciences of Philadelphia, were participants in an international conference on ostracods in Hall, England, last Summer. They presented a paper on the functional morphology of entocytherid ostracod copulatory appendages.

Willie M. Reams, Jr., associate professor of biology, University of Richmond, has been appointed Head of the recently formed Division of Biology at the Virginia Institute for Scientific Research. The biology program at the VISR will complement his research in progress through his academic affiliations.

Willie M. Reams, Jr., University of Richmond, and **Robert B. Seoggins**, Medical College of Virginia, as co-investigators, have received a grant for 3 years from NIH for \$64,622.00 in direct costs to study the origin and differentiation of Langerhans cells in the skin of the PET mouse.

Richard P. Sutter, formally Adjunct Biochemist, Presbyterian-St. Luke's Hospital, Chicago, Illinois and Instructor of Biological Chemistry, University of Illinois Medical School, has been named Assistant Professor in the Department of Biology at West Virginia University, Morgantown, West Virginia.

Lila Abrahamson, Assistant Professor, Department of Botany, University of Chicago, has been named Associate Professor, Department of Biology, West Virginia University, Morgantown, West Virginia.

William E. Collins, Ford Foundation Consultant in reproductive physiology recently returned from India, has been named Assistant Professor in the Department of Biology, West Virginia University, Morgantown, West Virginia.

Norman Lin, Assistant Professor of Zoology, Ohio State University, has been named Assistant Professor in the Department of Biology at West Virginia University, Morgantown, West Virginia.

Three new members will be added to the faculty of the Department of Botany, University of North Carolina, during 1967-68. **Lindsay S. Olive**, who has for some time been Professor of Botany at Columbia University, has accepted a position as Professor of Botany effective January 1, 1968. Dr. Olive received his Ph.D. from UNC in 1942 and is one of the leading mycologists in the country. The appointment of **Helmut Lieth** of Stuttgart, Germany, as Associate Professor of Botany was announced in our last issue. Dr. Lieth, who is an ecologist and an authority on world vegetation, will assume his duties July 1, 1967. **Clifford Parks** of the Los Angeles Arboretum, a taxonomist and geneticist who is primarily interested in chemotaxonomy and is also an authority on camellias, has accepted a position as Assistant Professor effective August 1, 1967.

Kenan Professor **John N. Couch**, Department of Botany, University of North Carolina, has reached the mandatory retirement age of 70 and is retiring on June 30, 1967, after a distinguished career of 45 years at UNC. Dr. Couch has published two books, over 80 papers, and has directed the work of numerous mycology graduate students, many of whom have become leaders in the field. Dr. Couch has established an international reputation as a mycologist and has received numerous awards, including membership in the National Academy of Science, Honorary Fellow of the National Academy of Science of India, Walker Grand Prize of the Boston Society of Natural History, Meritorious Teaching Award of the Association of Southeastern Biologists, Golden Jubilee Merit of North Carolina, and honorary Sc.D. degrees from Catawba College and Duke University. Although Dr. Couch will no longer be teaching we are pleased to report that he will devote full time to continuation of his research.

Promotions: The following assistant professors in the Department of Botany, University of North Carolina, have been promoted to associate professorships effective September 1: **Edward Barry**, **Clyde J. Umphlett**, and **A. Domnas**.

About Institutions

All of the science departments at **Hollins College**, Virginia, are now enjoying the extended space and additional facilities provided by a new science building which was completed in September.

The School of Forest Resources, **Mississippi State University, State College**, served as host to the annual meeting of the Southern Forest Environment Research Council in June.

Oak Ridge National Laboratories, Oak Ridge, Tennessee, has continued its excellent biological activities with

numerous seminars and training programs this summer. Participants, in addition to the permanent staff, were from all over the world.

The University of Georgia was awarded a \$3,719,000 grant by the National Science Foundation Tuesday, with the money to be used for development of a "center of excellence" in the biological sciences.

The Federal funds, to be allocated over the next three years, will be augmented with an additional \$6.8 million in University support. A NSF spokesman in Washington said the grant was made as a part of "a major Foundation effort to increase the number of first-rate scientific institutions in the United States. The program is designed to provide significant financial aid to academic institutions that are not among the foremost in science but have substantial present strength and, in addition, have shown sound planning for future improvement."

About \$1.5 million of the total grant will be used for new facilities. Another million will go for equipment and a million more will be budgeted for additional personnel.

New facilities will include an earth and plant sciences building, a new wing for the present biological sciences building, and renovation of existing facilities in the departments of entomology, biochemistry and biopsychology.

It is expected that 18 new faculty positions will be added, as well as additional supporting staff positions and positions for post-doctoral fellows and graduate assistants. New post-doctoral programs are to be added, and existing graduate training programs strengthened.

New equipment to be purchased with grant funds include a mass spectrometer and three electron microscopes. The balance of the funds will be used to "substantially augment resources for the sophisticated research programs being developed."

NSF has awarded nearly \$100 million to more than 25 other institutions of higher education in its three years of existence. The University of Georgia is the only institution, however, to receive an award designated specifically for the biological sciences.

(Continued from page 70)

to communicate with appropriate government or private agencies. The new committee will provide a new and more effective means of promoting the restoration or preservation of natural areas or resources in the southeastern states than ever before and, hopefully, before it is too late to act.

While growth in membership of the Association of Southeastern Biologists during the past decade has been generally upward, there seems to be reason to doubt that it has kept pace with the in-

crease in active, professional biologists of the southeastern states. No concerted effort for new members, no membership drives, have been undertaken for some time. Growth has been the result of individual activity of the more dedicated members.

There are many educational institutions in the Southeast, and many non-educational institutions employing biologists, in which there are no ASB members at all. These biologists may never have been invited to join. In many of the larger educational institutions there are biological science departments with no ASB members. These biologists may be somewhat isolated from active members who make it a point to extend personal invitations to prospective members.

On the assumption that much of the above speculation is true, your president feels that a modest effort toward inviting new members should be initiated this winter. The goal is not to gain a large number of new members *per se*, but to try to bring into ASB those non-member biologists who would be likely to contribute to the goals of the Association and to the general welfare of biologists and biological science in the Southeast. Those who have to be pressured or urged to join usually do not become very active and may not remain with ASB. But there must be many potentially good members who have not been invited.

Accordingly, approval of the Executive Committee for the printing of a new supply of membership application forms and for their widespread distribution will be sought at the October interim meeting at Emory University in Atlanta. (In fact, it may already have been done by the time you read this.) We will then ask an ASB member in every institution represented to distribute membership forms to each biologist in his institution who is not already a member. We shall also attempt to contact a biologist in those institutions not at present represented in the ASB roster, invite him to join, and also ask him if he will distribute membership forms to other biologists in his organization.

The whole process will take some time but it could result in a noticeable increase in membership before the next annual meeting at the University of Georgia, not just an increase in num-

bers but an increase in the kind of biologists who have made the ASB a respected, effective, and distinctive organization.

So if you are asked to help in this endeavor, we hope you will feel free to suggest procedures, institutions to be contacted, and potential new members. — HAROLD J. HUMM

SUGGESTED NOMINEES FOR ASB OFFICES AND EXECUTIVE COMMITTEE POSITIONS

To the members of the Nominating Committee:

I wish to suggest that you consider the following ASB members in selecting nominees for offices and executive committee positions:

PRESIDENT-ELECT
VICE-PRESIDENT
TREASURER
EXECUTIVE COMMITTEE MEMBERS (2 for 3-year terms)

Deadline: January 1

Mail to: DR. ELSIE QUARTERMAN
Box 1616, Station B
Vanderbilt University
Nashville, Tennessee 37203

MERITORIOUS AWARD NOMINATIONS

As in previous years, an honorarium of \$100 has been made available by the Will Corporation of Georgia, to be used as an award for the recognition of especially meritorious teaching by a member of the ASB. The regulations governing the award are as follows:

The recipient must be a member of the ASB in good standing. He should have taught biology in a southern institution for at least ten years, and must be currently teaching. He must not be a dean or have regular administrative duties beyond the department level (this particular criterion requiring interpretation in individual cases). Among evidences of his qualifications is the progress of the candidate as indicated by recognition in his own institution (important assignments and other contributions specifically related to good teaching); and the number and quality of students for whom he provided primarily the inspiration to continue in biology, especially those who later received advanced degrees.

Past recipients of the Meritorious Award for Teaching are as follows:

1952. Dr. Mary Stuart MacDougall (Agnes Scott)
1953. Dr. Orland E. White (Univ. of Virginia)
1954. Dr. Woolford B. Baker (Emory)
1955. Dr. John N. Couch (Univ. of North Carolina)
1956. Dr. Hugo L. Blomquist (Duke)

1957. Dr. Ezda Deviney (Florida State)
1958. Dr. Henry R. Totten (Univ. of North Carolina)
1959. Dr. Margaret Hess (Winthrop College)
1960. Dr. Ora C. Bradbury (Wake Forest College)
1961. Dr. Warren Deacon (Vanderbilt)
1962. Dr. Septima C. Smith (Univ. of Alabama)
1963. Father Patrick H. Yancey (Spring Hill College)
1964. Dr. Ruskin S. Freer (Lynchburg College)
1965. Dr. Harwell P. Sturdivant (Western Maryland College)
1966. Dr. Charles Ray, Jr. (Emory Univ.)
1967. Dr. H. J. Oosting (Duke University)

In these times in which so much is heard about teaching, it is particularly important that excellence in teaching should be rewarded and publicized in every way possible. Members of the ASB are urged to make nominations and send the needed supporting material to *Dr. H. Branche Howe, Jr., Dept. of Bacteriology, Univ. of Georgia, Athens, Ga. 30601, by February 1, 1968.*

COMMITTEE

LEWIS BERNER
WADE T. BATSON
H. BRANCH HOME, JR., *Chairman*

ASSOCIATION RESEARCH PRIZE

The rules and regulations governing the annual Association Research Prize of \$100.00, sponsored by the Carolina Biological Supply Company, Elon College, North Carolina, are as follows:

1. The Research Prize is to be awarded for an especially meritorious paper actually presented at the annual meeting.

2. Only members are eligible to submit papers in competition for the Research Prize. This applies to all names on the submitted paper.

3. Papers submitted in competition may be in press but must not have been published prior to March 1 of the year of the current competition.

4. Papers submitted in competition are judged by eminent scientists in the various fields of biology. These individuals are selected by the Research Committee and are from schools outside the Southeast. Every effort is made by the Research Committee to keep the authors of submitted papers anonymous. Criteria for the award are left to the discretion of the judges' panel, who may withhold said award if no paper is considered to have sufficient merit.

5. Papers must be submitted *in triplicate* and in their entirety not later than *February 15, 1968, to Dr. R. W. Hull, Dept. of Biological Sciences, Florida State University, Tallahassee, Florida 32306.* One copy of the prize-winning paper will

remain in the ASB files, but all other copies will be returned to the authors as soon as possible.

6. Announcement of the winner of the Research Prize will be made at the annual meeting.

IVEY F. LEWIS FELLOWSHIP AT MOUNTAIN LAKE BIOLOGICAL STATION

A Research Fellowship of \$150.00 for summer course study or research at Mountain Lake Biological Station of the University of Virginia has been continued through the generosity of the Phipps and Bird Company of Richmond, Virginia. This fellowship, formerly known as the *Phipps and Bird Research Fellowship*, was re-named at the request of the Phipps and Bird Company. Any member of the Association may submit an application. The application should be accompanied by a summary of the planned work, by a

list of important publications, and especially in the case of younger workers, by references and educational data. Applications should be sent to *Dr. J. J. Murray, Dept. of Biology, Univ. of Virginia, Charlottesville, Virginia 22903* not later than 15 March 1968. The selection will be made by the Research and Awards Committee of the ASB in consultation with the Director of the Mountain Lake Biological Station. The announcement of the recipient will be made at the annual meeting of the ASB.

COMMITTEE

J. J. MURRAY, *ex officio*
JAMES RIOPEL, *ex officio*
DONALD CAPLENOR
THOMAS L. QUAY
R. W. HULL, *Chairman*

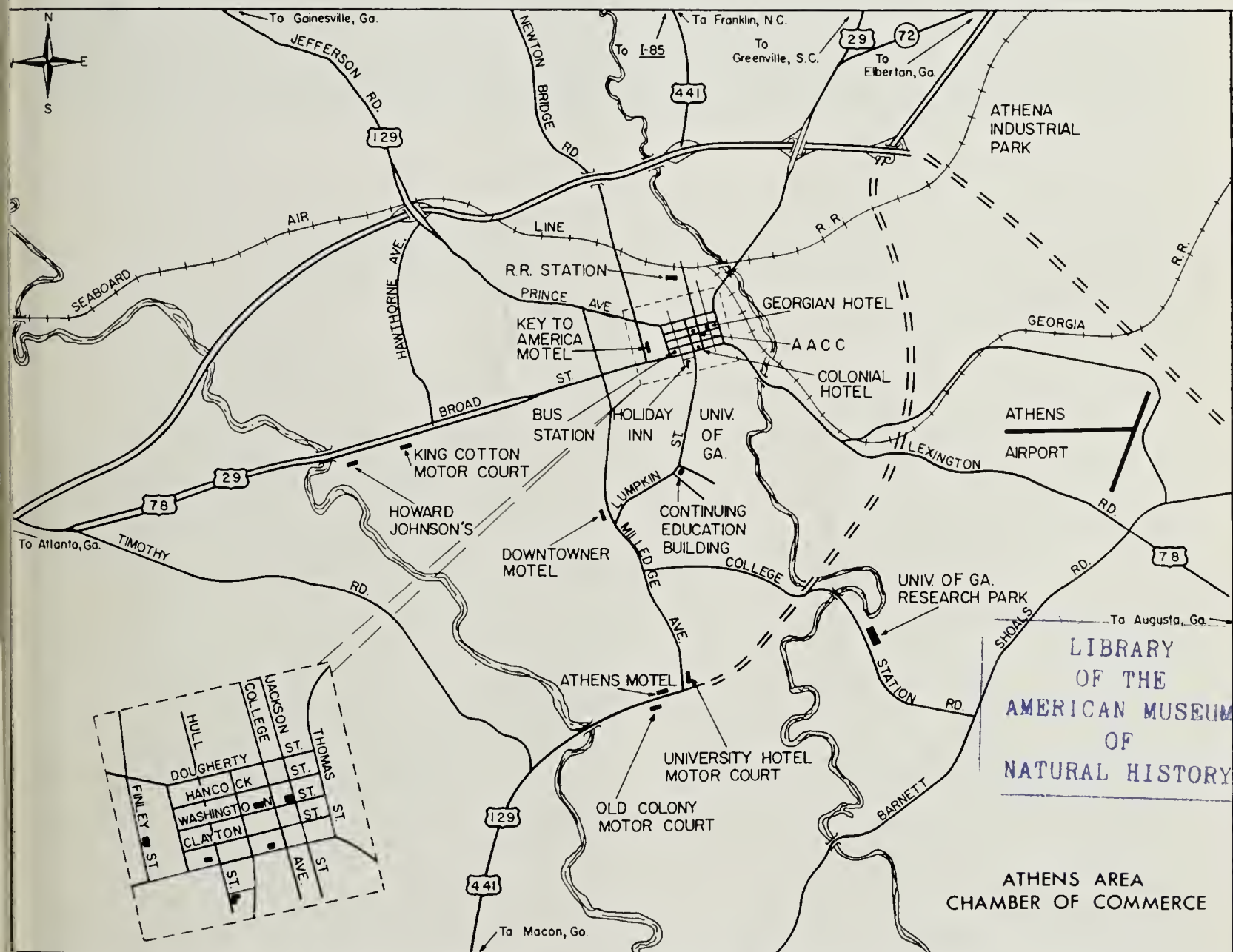


The ASB

BULLETIN

Volume 15, Number 1

January 1968



Map of the Athens, Georgia, Area

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Harold J. Humm, University of South Florida
Retiring President — Elsie Quarterman, Vanderbilt University
President Elect — Robert B. Short, Florida State University
Vice-President — Margaret Y. Menzel, Florida State University
Secretary — Dorothy L. Crandall, Randolph Macon Woman's College
Treasurer — John Carpenter, University of Kentucky
Executive Committee — Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — Position Vacant
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Louisiana — Harry J. Bennett, Louisiana State University
Mississippi — Joseph Fitzpatrick, Mississippi State University
North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College
West Virginia — Earl L. Core, West Virginia University

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman

CONTENTS

About the Athens Meeting	3
Multi-Lecture Approach Used at University of Georgia in Introductory Biology Classes	7
Non-Petrified Fossil Fungi — by Frederick A. Wolf	8
News of Biology in the Southeast	11





About the Athens Meeting

The Association of Southeastern Biologists will hold its 29th annual meeting 18-20 April, 1968, at the University of Georgia, Athens, Georgia. Registration and most of the other activities will be in the Georgia Center for Continuing Education. The program Thursday evening will begin with the General Session, which will be held at 7:30 in the Auditorium. The General Session will be followed by a smoker in the main lobby and adjacent dining rooms of the Center. Exhibits will be on display in the adjacent lounge. Paper sessions and the annual business meeting will be held Friday. The Friday evening banquet and presentation of awards will be held in the dining room of the Georgia Center. The retiring President's address will follow in the auditorium.

Dates of meeting — 18-20 April

Executive Committee Meetings

Georgia Center
1:00 P.M., Thursday
8:00 A.M., Saturday

Registration

Georgia Center
4:00 P.M. to 7:15 P.M., Thursday
8:00 A.M. to 11:00 A.M., Friday
Fee — \$2.00

Exhibits

Georgia Center, Main Lounge
2:00 P.M. to 11:00 P.M., Thursday
8:00 A.M. to 5:00 P.M., Friday
8:00 A.M. to 11:00 A.M., Saturday

Paper Sessions

Georgia Center, Auditorium and Meeting Rooms, Friday.

On Thursday the Southern Section, American Society of Plant Physiologists will hold their paper sessions in Lecture Rooms of the Biological Sciences Building.

GENERAL INFORMATION

Athens is a city of 50,000 located in the Piedmont Province at about 550-750 feet above sea level. It is 45 miles from the Blue Ridge Province and 65 miles from the Coastal Plain. The

surrounding area is largely of pasturelands and extensive wooded areas which are predominantly of pine or mixed hardwoods and pine. Over 100 manufacturing firms operate in Athens-Clarke County. The University of Georgia, however, is by far the largest organization financially. It covers more than 3,500 acres and is housed in more than 80 buildings. Enrollment is over 15,500. A 300-acre Research Park is located just southeast of Athens. Several state and federal research laboratories have already located in the Park.

There are many things of interest at the University of Georgia, the Research Park, and near and in Athens. Information about some of these is given below. Other information may be obtained at the Registration Desk, or by writing in advance to the appropriate person(s) indicated below.

Travel to Athens

Suggested automobile routes to Athens are as follows: *From the south* follow I75 to Forsyth, Ga83 to Madison, and US441 to Athens. — *From the east* follow US78 (or US378 to Washington and then US78). — *From the northeast* follow I85 to intersection with US441 and then south on US441 to Athens. — *From the north* use US441. — *From the northwest* follow I75 and US41 to Atlanta and then US285 bypass and I85 to intersection with US129 which follow to Athens. — *From the west and southwest* go to Atlanta and take I20 to Conyers (don't take first exit), Ga138 to Monroe, and US78 to Athens.

The Seaboard Railroad, and the Southeastern Stages, Greyhound, and Trailways Bus lines provide ground transportation to Athens. Southern Airways is the only airline serving Athens. However, air taxi service is available at \$10.00 one way both from and to Atlanta, through the Athens Aviation, Inc. If reservations cannot be obtained through usual means, write Athens Aviation, Inc., Athens, Georgia, 30601, or phone them (Area 404-543-5000). Limousine fare from the Athens Airport to the Georgia Center is available at \$1.00 one way for a passenger and baggage.

The Georgia Center is located on South Lumpkin Street in the west edge of the University of Georgia Campus.

Parking

Ample parking facilities are available in the main parking lot behind the Georgia Center. This lot is the large one just north of the Coliseum. Parking elsewhere on the University campus is essentially impossible. Automobiles are towed away from reserved parking spaces on the campus. However, the Science Center buildings are located in a group and within a short distance from the Georgia Center.

Dining Facilities

There is a dining room and a small coffee shop at the Georgia Center. The coffee shop is usually crowded between 12:00 and 12:45. These eating facilities, at some meals, probably will not be able to handle all those who would like to eat there. Since parking is no problem at the Georgia Center, those having automobiles may wish to drive to motels or hotels serving meals, if the above facilities are crowded. The University cafeteria in Bolton Hall on Baxter Street adjacent to Creswell Hall, a nine-story dormitory, can serve a good number of people. The waiting lines are usually short, except for 20 to 30 minute periods beginning about 11:00 A.M., 12:15 P.M., and 1:20 P.M. Other University eating facilities are usually very crowded or are essentially inaccessible. There are a number of other public eating establishments in Athens. Several are on Baxter Street which begins at Lumpkin Street near the stadium and ends at Beechwood Shopping Center, where there is a cafeteria.

Local alcohol mores

Beer and wine are sold at package stores and are served in many restaurants, but no hard liquors are sold.

Placement Service

A registry of employers and potential employees will be established. Interviews will be arranged, if possible. The usual employment opportunity bulletin board service will also be available. Registry of employers and potential employees may be done at the registration desk or by writing to Lynn Raulerson, Department of Zoology.

Field Trips

Pending expression of interest, a number of field trips are planned. Those persons interested should, if possible, contact the individual(s) planning the trip(s) before arriving in Athens.

1. Wednesday and Thursday — Mycologists of the A.S.B. are planning two trips, one on Wednesday which is to be all day and returning to Athens that night. The second trip is to be half day, Thursday morning, the group returning to Athens for lunch. Any interested person should contact Dr. Richard T. Hanlin, Department of Plant Pathology and Plant Genetics for particulars.
2. Thursday — For early arrivals at least one short trip near Athens is being arranged. For information about this and other suggested activities for the afternoon, see below under "Other Activities."
3. A Saturday morning trip to Echols Mill granitic outcrop about ten miles northeast of Lex-

ington, Georgia, is being planned by Dr. Samuel Jones and Dr. J. Bruce Wallace. This trip is to feature aquatic biology as well as ecological and floristic aspects of communities typical of granitic outcrops. Temporary and permanent pools of water and a stream which runs for some distance over the rocks provide plant and animal life which should be of interest to biologists. The granitic habitats are especially interesting. In addition to species typical of such habitats, there are some of unusual occurrence, such as species disjunct from the Coastal Plain. The group will return to Athens by noon. Those in private automobiles may instead proceed directly home. For particulars, contact Dr. Jones of the Botany Department or Dr. Wallace of the Entomology Department.

4. Two Saturday trips are being planned by the Southeastern Division of the American Society of Ichthyologists and Herpetologists. For those interested in fishes, there will be collecting in the headwaters of the Ogeechee River. For those interested in herptiles, collecting north of Gainesville, Georgia, should provide an array of salamanders. Interested persons should contact Dr. John P. Kerr, Zoology Department.
5. A Saturday trip to the Savannah River Ecology Laboratory at the AEC Savannah River Plant near Augusta, Georgia, is being planned by Robert J. Beyers, Director. Travel from Athens to the Savannah River Plant will be by private car, leaving Athens at 8:00 A.M. An escorted tour by bus will include laboratory and field research facilities. A nominal fee will be required for lunches. The program will terminate at approximately 4:00 P.M. Because this Laboratory is located on a U. S. reservation, it is required that all visitors be citizens of the United States, and be 18 years of age or older. All persons planning to attend must register with Dr. Beyers, SREL, P. O. Box A, Aiken, South Carolina, prior to Thursday, April 18. Because of security regulations, no late registrations can be accepted. Also, no cameras or binoculars may be taken on the tour.

OTHER ACTIVITIES

Thursday afternoon

1. A short tour of local laboratory and field research facilities will be conducted by Dr. John McGinnis and Dr. Eugene Odum. Interested persons should meet at the main entrance of the Georgia Center at 4:00 P.M.

2. The Southeastern Water Laboratory will conduct a guided tour of their laboratories from

3:00 to 5:00 P.M. Persons having special interests are invited to ask that conferences be set up with specific staff members anytime during the day on Thursday or Friday. Interested persons should write Dr. H. Paige Nicholson, of the Southeastern Water Laboratory.

Thursday and Friday 8-5, Saturday 8-12

The following collections will be open with attendants present to assist visitors:

1. Mycological Herbarium. Room 213, Barrow Hall.
2. Herbarium of vascular plants, bryophytes, and lichens. Room 529, Biological Sciences.
3. Insect Museum. Room 420, Biological Sciences.
4. Bird and Mammal Range. Room 304, Biological Sciences.
5. Herpetological and Ichthyological Ranges. Room 302, Biological Sciences.

Persons interested in visiting personnel or facilities of various departments may go to the main offices for information and directions. Office locations are as follows:

Botany — 505 Biological Sciences
 Entomology — 415 Biological Sciences
 Microbiology — 831 Biological Sciences
 Plant Pathology and Plant Genetics — 215
 Food Science
 Zoology — 724 Biological Sciences

Visitors are invited to discuss aspects of the new Introductory Biology program with Dr. Hope Ritter, Room 409A or Dr. Joseph Hindman, Room 510, on Thursday or Friday. (See article on page 7.)

Thursday and Friday 9-5, Saturday 9-12

The Art Museum near the north end of the campus will be open for visitors. The nearest available parking will probably be at meters on the edge of the Athens business district. *Caution:* Automobiles are towed away from reserved parking spaces on the campus.

Thursday thru Saturday

A self-guided tour of Athens has been organized. Brochures may be obtained at registration or by writing Dr. Joe Edmisten, Department of Botany. Those wishing to have transportation provided for a tour of Athens and the University should write Dr. Edmisten before the meetings. The tour will begin at 2:00 P.M. Friday, if a sufficient number of people are interested.

The University swimming pool in Stegeman Hall, west of the stadium, will be open to A.S.B. visitors on Thursday and Friday between 2:30 and 5:30 P.M.

ACCOMMODATIONS

It is advisable to make reservations by 15 March. Write directly to the hotel or motel. The Georgia Center will handle their reservations and require double occupancy of all rooms to insure convenience in housing to the maximum number of persons. Room rates are given below. The symbols following name of establishment indicate the following:

(—) — number in parenthesis indicates
mileage to the Georgia Center.

R — Eating facilities. S — Swimming pool.

	No. of Units	Type Room	Price
GEORGIA CENTER (0) R			
University of Georgia	138	Double	\$10.00
UNIVERSITY INNS, INC. (0.2) R			
998 S. Lumpkin St.	50	Single	\$ 5.00
Men only!		Double	7.00
Connecting baths only.			
DOWNTOWNER MOTOR INN (0.6) RS			
Milledge and Lumpkin	71	Single	\$ 8.00
		Double	10.50
		Twin	12.00
		First Floor	1.00 extra
HOLIDAY INN (0.9) RS			
2 blocks from Broad and Lumpkin	98	Single	\$ 9.00
		Double	12.00
		Twin	14.00
COLONIAL HOTEL (1.0)			
179 E. Broad	few	Single	\$ 3.50
		Double	5.00
		Twin	5.50
GEORGIAN HOTEL (1.2)			
247 E. Washington	125	Single	\$ 5.00-\$ 7.00
		Double	7.00- 9.00
		Twin	8.00- 9.00
KEY TO AMERICA (1.3) RS			
230 N. Finley	87	Single	\$ 8.00
		Double	12.00
		Twin	12.00
UNIVERSITY HOTEL COURT (1.9) S			
US 441 South	81	Single	\$ 8.00
		Double	10.00
		Twin	12.00
ATHENS MOTEL (2.3) S			
US 441 South	56	Single	\$ 7.00
		Double	9.00
		Twin	10.00
		Efficiencies	2.00 extra
OLD COLONY MOTOR INN (2.4)			
US 441 South	31	Single	\$ 8.00
		Double	10.00
		Twin	11.00

KING COTTON MOTOR COURT (3.3)

US 78 West	15	Single	\$ 6.00
		Double	7.00
		Twin	8.00

HOWARD JOHNSONS (3.6) RS

US 78 West	60	Single	\$ 9.00
		Double	13.00-\$14.00
		Twin	14.00- 16.00

BULLDOG INN (5.0)

US 441 North	31	Single	\$ 8.00
		Double	10.00
		Twin	12.00

Most of the above have rooms which hold more than two persons, the additional person rate usually being \$1.00 or \$2.00 each.

CAMPING FACILITIES

The nearest campsites are as follows: 17 miles south of Athens on Ga15 in Oconee National Forest. 25 miles W of Athens on Ga81 in Fort Yargo State Park near Winder. 28 miles southeast of Athens off US278 in Hard Labor Creek State Park near Rutledge. 30 miles north-northeast of Athens off US29 in Victoria Bryant State Park. 47 miles north of Athens and east of Cornelia at Lake Russell in the Chattahoochee National Forest. Hot and cold showers are available at Hard Labor Creek State Park.

LOCAL ARRANGEMENTS COMMITTEE

Co-Chairmen	W. H. Duncan D. S. Scott
Housing and Family Activity	J. A. Edmisten
Banquet, Food Services	C. D. Monk
Smoker, Exhibits	G. E. Michaels
Publicity	G. L. Plummer
Field Trips	S. B. Jones J. B. Wallace R. J. Beyers
Meeting Rooms, Audio-Visual	W. C. Carlton Grace Thomas
Transportation	J. A. Edmisten
Registration	Alma Walker A. B. Weathersby H. R. Hermann Lynn Raulerson
Placement Service	Lynn Raulerson
Finance	E. E. Byrd
Program	D. S. Scott W. H. Duncan

MARY GLIDE GOETHE TRAVEL AWARDS

For the tenth year there will be funds available through the generosity of the late Mr. C. M. Goethe for assistance to graduate students for expenses in connection with the annual ASB meet-

ings, to be held this year at the University of South Carolina, Columbia, S. C. Approximately \$300 will be available from the contributions of Mr. Goethe, and it is anticipated that most of the awards will be for maintenance (lodging and meals), and departments are urged to provide travel allowances for their graduate students or to invite them to travel in cars with staff members. Some travel allowances may be awarded by the committee to those living most distant from Columbia.

Staff members are requested to call to the attention of qualified students in their respective institutions the availability of these awards. If there is more than one applicant from a department, the Goethe Committee may request the department to aid the committee's selection by ranking the applicants.

Any graduate student needing financial assistance in order to attend the 1967 meeting of the Association of Southeastern Biologists is eligible. Rules for making application for the Goethe Awards are as follows:

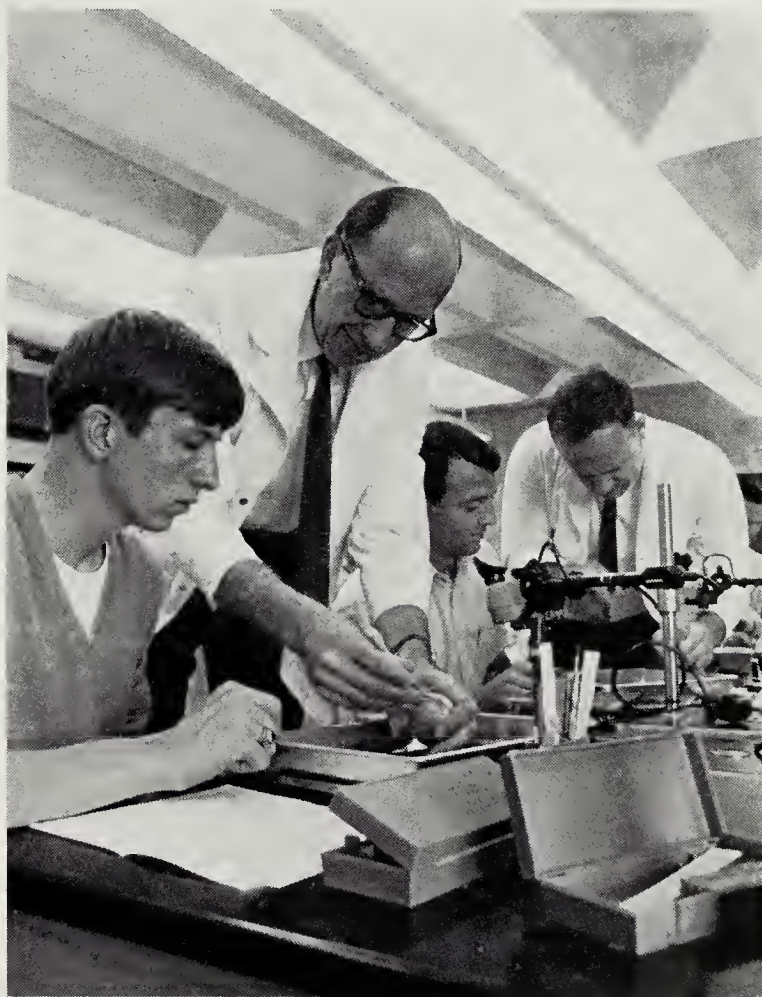
1. Indicate if application is being made for maintenance or travel or both. Give details, such as total sum requested, how many nights and days are involved, if travel allowance is requested, the number of miles involved and the proposed method of transportation, and any other pertinent information.
2. Give information as to whether or not a paper is being presented by the applicant.
3. In a paragraph, give a brief history of your education to date, of how many years you have been — and plan to be — in graduate school, of your major field or fields of interest, of any publications which have appeared or which may be in preparation, and any other pertinent professional details. Give information on marital status and number of children.
4. Give your source or sources of support while in graduate school such as G.I. Bill, N.S.F., N.I.H., teaching assistantship, etc.
5. Have your major professor or departmental head write a letter supporting your application.
6. Applications and supporting letters, both in triplicate, should be in the hands of *Dr. C. J. Umphlett, Dept. of Botany, Univ. of North Carolina, Chapel Hill, N. C. 27514*, by 1 March 1968. Applicants will be notified of the decision of the Committee during March.

PAUL C. BAILEY
WILLIAM E. BRILLHART
C. J. UMPHLETT, *Chairman*

Multi-Lecturer Approach Used at University of Georgia in Introductory Biology Classes

How to make a science course meaningful to a student who is one of hundreds in a room, who may have had virtually no secondary preparation for the course, and who may be taking it simply because he has to is a challenge Dr. Hope Ritter and Dr. Joseph Hindman are tackling at the University of Georgia.

They're working with a "multi-lecturer approach." Instead of one teacher presenting the entire introductory biological sciences course, eight professors this quarter are participating.



Dr. Hope Ritter (left) and Dr. Joseph Hindman Work in 'Multi-Lecturer' Program. University of Georgia Biologist Strive For Personal Contact With Students.

Each one lectures in the particular area of biological science which is his specialty. Next quarter, 12 to 15 faculty members will present one or more lecture.

"The students realize they're getting the best this way," says Ritter, "although many of them prefer the security of becoming accustomed to only one lecturer. Of course, this approach doesn't reduce the number of students in the class, but Dr. Hindman and I try to compensate for that.

"We try to make them feel they are being regarded as individuals who are eligible to consult with their professors by appointment. We encourage them to ask questions, and they respond. Many times we lecture up the aisle in order to be closer to the student."

Ritter points out that the small group meetings in the laboratory allow for additional close contact. In addition to two teaching assistants and Ritter and Hindman, senior level faculty members also circulate among the students in the laboratory sections from week to week. As in the classroom, the teacher's approach to laboratory learning is also a break from tradition.

"Biology is the science of living things," says Ritter, "but the traditional approach has been one presenting preserved specimens — no life, no red blood, no yellow fat. But through a local supplier, we get live clams and squid from the Chesapeake Bay area to illustrate both organizations at this level of complexity as well as the principle of adaptive radiation commonly seen in living things.

"Too, the students are trained in the use of the best microscopes available, fitted with phase-contrast optics. They see living things at microscopic level with a clarity that introductory biology students elsewhere are not afforded."

Ritter says that other universities are converting to an audio-visual type program of teaching in the attempt to solve the problem of large classes in introductory courses.

"That puts a student in a booth with programmed information and a faceless professor," he protests. "I don't think anyone can replace an enthusiastic team of teachers willing to take time from their research in the attempt to make biology interesting and meaningful — teachers who want students to be stimulated to the point of going into the lab with bounce and zest."

Ritter credits John O. Eidson, Dean of the College of Arts and Sciences, and Donald C. Scott, Head of the Division of Biological Sciences, with the vision that has resulted in a truly contemporary biology program.

"Also, the atmosphere at Georgia is healthy for combining teaching with research. Research is my life also; without it the academic experience is incomplete. Here, I can conduct research without pressure and relate it in its place to the students, but at a realistic level that does not result in student neglect."

Ritter says they try not only to teach students biology but also to instill in them an awareness of their importance as biological units themselves in time and space.

"Biology is constantly exciting," he feels. "Creation of some form of 'test tube life' is almost at hand. Regardless of what a student is majoring in, we want him to feel this excitement."

One student's reaction to the course perhaps indicates a degree of success: "I made a D⁺ and it was the hardest course I've ever taken. But I got a lot out of it, and I could have done better if I had studied more effectively."

This instructional program is indicative of the activity in Biological Sciences which earned for the Division a \$3,719,000 grant this summer from the National Science Foundation. The grant will be used for development of a "center of excellence" in biological sciences and was awarded on the basis of "substantial present strength" and "sound planning for future improvement."

Non-Petrified Fossil Fungi

Frederick A. Wolf, *Duke University*

The word fossil, as defined in Webster's Unabridged Dictionary means "Any impression or trace of an animal or plant which has been preserved in the earth's crust; in scientific usage not restricted to remains of a stony nature." But in common parlance fossils are regarded as very old, petrified remains of animals or of plants. In the present account consideration is given to fungal spore remains that are "not of a stony nature," and that occur in the lacustrine deposits of various bodies of water in East Africa. It has been well established by limnologists that lake sediments contain the corpses of many species of animals and plants that presently are living in or near lakes and their influents or that once lived there. Additionally, it has been found that such sediments contain both pollen and fungal spores conveyed to the lakes, even for considerable distances, by air currents. In a very real sense, therefore, lakes must be regarded as natural history museums or repositories that provide abundantly for studies of both contemporary and extinct faunas and floras.

It is to paleontologists from their examinations of carbonaceous, calcified, and silicified specimens, that we owe our knowledge primarily of the kinds of animals and plants that formerly lived on our planet. They have established that many of both groups became extinct millions of years ago. But, palynologists by examination of deposits in peat bogs, first found, only about 50 years ago, that pollen of many kinds of plants

occurs in such sites. Since the pollen was so perfectly preserved they were able to identify the genera, and in some instances even the plant species that produced this pollen. Subsequently they found that pollen is always present in sediments of swamps, marshes, ponds, lakes, streams and various other sites that contain alluvial material. By use of carbon dating and of related techniques, close approximations have been established of the time of deposition of any given sediment at different depths or levels. As a result of these findings it is deduced that such conditions as favor pollen preservation in sediments should also favor the preservation of fungal spores for hundreds and perhaps thousands or millions of years. To date, however, meager consideration has been given to determining the incidence of the kinds, and the age of fungi in deposits from any of these aforementioned sites.

Palynologists have indicated that the several factors which contribute to the preservation of pollen in lacustrine deposits include (1) dearth of oxygen and light, (2) uniformity of temperature and moisture, (3) the chemical nature of the constituent organic and inorganic materials, (4) and the acidity or alkalinity of the sediment. Each of these factors, as well, may contribute to the preservation of fungal spores. The chemical nature of the spore wall itself, i.e. whether the constituents of the walls are or are not resistant to decomposition in sediment may be anticipated to constitute an additional factor.

Different species of pollen have been found to occur at different depths in sediments. Palynologists have interpreted this finding as evidence of sequential changes that have transpired in the floras of given regions. Their results suggest that it should be possible to correlate the kinds of spores in lacustrine deposits with the kinds of pollen and thus with sequences in types of vegetation. The writer will consider the results of his attempts to establish whether such correlation can be shown to exist.

Materials and Methods

The samples of sediment examined in my studies were collected by Dr. D. A. Livingstone and Mr. Robert Kendall, Duke University, Depart-

ment of Zoology, and Dr. J. L. Richardson, Franklin and Marshall College, Department of Biology. The oldest of these sediments date from the termination of the Ice Age. Samples were prepared from cores taken from the following lakes in Uganda, Kenya, Zambia, and Tanzania: Bujuku, Chila, Chishi, Kitandara, Naivasha, Mahoma, Shiwa Ngandu, Tanganyika, and Victoria. Samples of sediment, taken from the interface of water and sediment from several other smaller lakes and from water holes, were also examined.

The coring devices used are adequately described in Kummel's "Handbook of Paleontological Techniques" (Wright, Livingstone, and Cushing, 1964). The cores ranged in length from a few meters to approximately 30 meters. Samples, consisting of 0.10 cc or 1.00 cc of core material, were selected at 0.10 meter depth intervals. They were treated according to the acetolysis method devised for pollen analysis by Erdtman (1960). This method employs treatment with strong acids and alkali, repeated centrifugation, and washing, finally to secure a residue that is mounted on microscopic slides.

Findings

The results of microscopic examination of sediments from the several East African bodies of water have been interpreted to support the following conclusions:

(1) The number and kinds of fungal spores contained in the sediments of different lakes differ. The number of spores, moreover, present at different depths in any given lake also differ, spores being most abundant in the upper portions of the deposits. An entirely satisfactory explanation for such occurrence is not available at this time. The number of spores per cc of sediment ranges from none to nearly 60,000. (2) Both hyaline and pigmented spores are found. Spores may become discolored as a consequence of acetolysis. Since the presence or absence of pigment in spores is regarded as a basic taxonomic feature it becomes difficult to classify genera by examination of acetolyzed material. (3) The spores from sediment appear to be intact. They have retained their shape and pattern of septation but lack protoplasmic contents. Spore walls may re-

sist decomposition whereas cell content is readily decomposed. (4) The shape and septation of spores found in sediments is like that of contemporary genera and on this basis, with a reasonable degree of assurance, they can be assigned generic names presently given to contemporary genera. Others remain without tentative identification. Little basis appears to exist for employing the suffix "ites" to generic names of ancient kinds. (5) Several interrelated factors, for which proof of their influence is lacking, may be established to be causally related to the paucity of spores in sediments of certain lakes, and to account for differences in numbers of spores at different levels. These factors are postulated to be (a) year after year burning of the vegetation in the area surrounding the given lake, a practice widely employed to provide grazing for the animals and to facilitate hunting, (b) protracted periods of drought that may extend over several years, (c) sporadic eruption of nearby volcanoes with consequent accumulation of volcanic ash, (d) erosive effects of heavy rainfall and accompanying soil movement into the lakes, (e) and grazing pressures from herds of both domestic kinds of animals and of indigenous kinds. (6) The fungus flora of East Africa is insufficiently known. Until extensive mycological surveys have been made it will remain impossible to correlate the kinds of spores found in lake sediments with the types of vegetation, past and present. The surveys should stress the fungus flora found on aquatic seed plants and on terrestrial species growing in the immediate area surrounding the lakes. (7) It was anticipated that spores of certain widely-prevalent genera would be found in the lacustrine deposits, but they were found to be sparse or else totally lacking. Explanation for such non-occurrence was sought by experimentation involving acetolyzing known kinds of spores and by subjecting known kinds to decomposition under conditions that simulate, to a degree, natural conditions in lakes. As a result it was learned that the spores of some species of fungi are destroyed by

acetolysis, others remain intact, and that some kinds are decomposed if stored for a few months in sediment, whereas others withstand decomposition. These findings constitute partial explanation for the absence of fungal spores of certain species in sediments. They also indicate that more should be learned about the chemical nature of spore walls and their biosynthesis than is presently known. Additional explanations are being sought to account for the presence and absence of fungal spores in sediments. (8) It is becoming increasingly obvious that some genera of fungi have not undergone morphological changes during the time that has elapsed since the Ice Age, and we should not be surprised if the age of spores in sediment or in shale will be found to extend to millions of years. This is not to say that evolutionary changes in physiology of some species have not taken place, with the passage of time. The inevitable conclusion is that fungi, in order to survive, have accommodated themselves to the vicissitudes of climatic and other environmental changes.

References

- Erdtman, G. 1960. The acetolysis method. *Svensk. Bot. Tidskr.* 54: 561-564.
- Wright, H. E., D. A. Livingstone, and E. J. Cushing. 1964. Coring devices for lake sediments. In Kummel, H., (editor). *Handbook for paleontological techniques*. W. H. Freeman & Co., San Francisco. (Vide pp. 494-520).
- Wolf, F. A. 1966a. Fungus spores in East African lake sediments. *Bull. Torrey Bot. Club* 93: 104-113.
- . 1966b. *Idem.* II. *Jour. Elisha Mitchell Sci. Soc.* 82: 57-61.
- , and S. S. Cavaliere. 1966c. *Idem.* III. *Jour. Elisha Mitchell Sci. Soc.* 82: 149-154.
- . 1967a. *Idem.* IV. *Bull. Torrey Bot. Club* 94: 31-34.
- . 1967b. *Idem.* V. *Mycologia* 59: 397-404.
- . 1967c. *Idem.* VI. *Jour. Elisha Mitchell Sci. Soc.* 83: 113-117.
- . 1967d. *Idem.* VII. *Bull. Torrey Bot. Club* 94: 480-486.
- . 1967e. Disintegration of fungus spores. *Jour. Elisha Mitchell Sci. Soc.* 83:



News of Biology in the Southeast

Joseph F. Fitzpatrick, Jr. — Editor

About People

Robert F. Smart, Professor of Biology and Dean of Richmond College, University of Richmond, Virginia was appointed Provost of the University, effective 1 March 1967. He will be in charge of all academic affairs of the seven colleges which constitute the University of Richmond.

L. R. Hesler, Dean and Professor of Botany, Emeritus, Department of Botany, University of Tennessee, Knoxville, has recently published a book, "Entoloma in South-eastern North America." This taxonomic work on mushrooms is provided with keys and is copiously illustrated.

Frank B. Golley has been appointed Executive Director of the Institute of Ecology of the University of Georgia. **Robert J. Beyers** will replace Dr. Golley as Director of the Savannah River Ecology Laboratory, Aiken, South Carolina, which facility is operated by the Institute of Ecology for the U. S. AEC. **Eugene P. Odum** continues as Director of the Institute.

New staff members of the Institute of Ecology of the University of Georgia include **I. Lehr Brisbin**, **D. A. Crossley**, **Dirk Frankenberg**, **J. Whitfield Gibbons**, **John T. Hays**, **Philip L. Johnson**, **R. Larry Marchington**, and **William J. Wiebe**.

Jerry H. Cromer has been appointed Assistant Professor of Biology, Converse College, Spartanburg, South Carolina. He will assume his duties at the beginning of the Spring Semester of 1968.

Louis G. Williams has joined the staff of the Biology Department, University of Alabama, Tuscaloosa. He is returning to academic life after ten years of research activities with the federal government.

New staff members of the Department of Biology, East Tennessee State University, Johnson City are: **Jasper H. B. Garner**, Associate Professor, Dr. Garner formerly was a member of the faculty of the Department of Botany of the University of Kentucky, received his Ph.D.

from the University of Iowa and is interested in bark fungi and Gasteromycetes; **W. Donald McGavock**, Associate Professor, Dr. McGavock is a former member of the staff at Wofford College, was awarded the terminal degree by the University of Tennessee and is interested in cestodes; **Milo E. Richmond**, Assistant Professor, Dr. Richmond received his terminal degree from the University of Missouri and is interested in vertebrate reproduction; and **Franklin D. Robinson**, Assistant Professor, Mr. Robinson is completing the requirements for the Ph.D. degree, with research in plant ecology, at Vanderbilt University.

Two members of the staff of the Department of Biology, East Tennessee State University, Johnson City, have been awarded the Ph.D. degree in the summer of 1967. Virginia Polytechnic Institute awarded the degree to **James E. Lawson** who presented a dissertation on the systematics of pseudoscorpions. **Wallace A. Tarpley** offered a dissertation in the ecology of insects to the University of Georgia for his degree.

Herman O'Dell, Professor of Biology, East Tennessee State University, Johnson City, is currently on leave of absence to Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Harry L. Powe, Associate Professor of Biology, East Tennessee State University, Johnson City, is Secretary-Treasurer of the newly-formed Southern Appalachian Club of the Society of the Sigma Xi.

W. Dwight Billings, Duke University, Durham, North Carolina, has been promoted to James B. Duke Professor of Botany. These professorships are the highest academic rank awarded at Duke. Dr. Billings' research interests are in plant ecology.

William Lee has joined the faculty of the Department of Zoology and Physiology, Louisiana State University, Baton Rouge, where he will teach in his research area of mutagenesis. Dr. Lee comes to L.S.U. after sojourns at the Universities of New Hampshire and Texas, fol-

lowing receipt of his degree from the University of Wisconsin.

Mason E. Hale, a student of lichens, has been appointed Acting Chairman, Department of Botany, Smithsonian Institution, Washington, D. C., for the year 1 July 1967 to 30 June 1967. Dr. Hale succeeds **William L. Stern** who resigned to become Professor of Botany at the University of Maryland, College Park.

Stanwyn G. Shetler, Associate Curator of Phanerogams, Department of Botany, Smithsonian Institution, Washington, D. C., was awarded a one-year grant of \$32,800 by the Smithsonian Research Foundation to continue his research on North American Campanulaceae and to develop a computer data-processing program for the Flora of North America Project. In connection with his role as Secretary of FNA he has spent several weeks in Canada and Europe this fall and attended the Symposium on Information Problems in the Natural Sciences in Mexico City in December.

Among the botanists of the Smithsonian whose research problems have carried them abroad during the fall are: **Thomas R. Soderstrom** (grasses), to Indonesia and Ceylon; **Edward S. Ayensu** (anatomy), to West Africa; and **David B. Lellinger** (ferns), to Costa Rica where he participated in the teaching program of the Organization for Tropical Studies prior to his field activities.

Stanley R. Gemborys has been appointed Assistant Professor of Biology, Hampden-Sydney College, Hampden-Sydney, Virginia, effective September 1967. He received his doctorate from Auburn University in Botany, specializing in ecology.

Three new staff members of the Department of Biology, Samford University, Birmingham, Alabama, all with the rank of Assistant Professor, are: **Ellén McLaughlin**, an embryologist with a terminal degree from Emory University; **Bennie R. Ford**, a parasitologist with the Ph.D. from the University of Oklahoma; and **Allan Hayse**, a physiologist graduated from Louisiana State University. Their appointments began in September 1967.

Four new faculty members have joined the staff of the Biology Department, Richmond Professional Institute, Richmond, Virginia. These include **James C. Harlan**, a recent Ph.D. from the University of Mississippi; **T. Dan Kimbrough**, formerly a member of the faculty of Birmingham Southern College; **John D. Reynolds**, formerly of the faculty of the University of Southern Mississippi, and **J. Miles Sharpley** of Sharpley Laboratories, Inc., Fredricksburg, Virginia.

Philip E. Hildreth joined the University of North Carolina, Charlotte, in September 1967, as Chairman and Distinguished Professor of Biology. Dr. Hildreth

is the first Distinguished Professor at the Charlotte campus. He was formerly associated with the Lawrence Radiation Laboratory at the University of California, Berkeley, where he was an associate of Curt Stern.

G. Richard Hogan joined the University of North Carolina, Charlotte, in September 1967, as Assistant Professor of Biology. He was formerly with the Laboratory of Radiobiology, School of Medicine, University of California, San Francisco Medical Center.

L. A. Hetrick, Professor of Entomology, University of Florida, Gainesville, has been elected President of the Florida Entomological Society for 1968.

Charles E. Miller, Associate Professor of Botany, Ohio University, Athens, Ohio, has been awarded an NSF grant to study taxonomic characteristics of chytridiaceous and other phycomycetous fungi.

Bosiljka Ristanovic, Fulbright Research Scholar, Department of Botany, Athens, Ohio, from the Biological Institute University of Sarajevo, Yugoslavia, has received a Fulbright-Hays award to study aquatic phycomycetous fungi with **Charles E. Miller** for a ten-month period beginning September 1967.

G. W. Hunter, III, Lecturer in Microbiology and Biological Sciences, College of Medicine, University of Florida, Gainesville, retired and became "Emeritus" on 31 December 1967. He has taught parasitology courses in the College of Medicine and Department of Zoology since joining the University in 1956. One of his publications, "A Manual of Tropical Medicine", co-authored with W. W. Frye and J. C. Swartzwelder, has just announced a first reprinting of the fourth edition. He will retire to Sun City Center, P. O. Box 5418, Florida 33570.

William T. Penfound, formerly Professor of Botany at the University of Oklahoma, has recently become Chairman of the Department of Biology, Warren Wilson College, Swannanoa, North Carolina.

New members of the faculty of the Department of Biology, Georgia State College, Atlanta are **John Parker** and **John Payne**. Dr. Parker received his degree from Stanford University working under the direction of A. C. Giese. Dr. Payne is a virologist formerly with the University of Alberta.

Peter E. Gaffney of the Department of Biology, Georgia State College, Atlanta, is on a one-year leave of absence while he acts as a Fulbright-Haynes Lecturer. He is in residence at the University of Ireland, Dublin.

J. F. Celecia has been appointed Associate Professor and Chairman of the Biology Department, Belmont Abbey College, Belmont, North Carolina. Dr. Celecia was formerly Head of the Biology Department, Central Piedmont Community College, Charlotte, North Carolina.

Ernest D. Seneca has been appointed Research Associate in the Departments of Botany and Soils, North Carolina State University, Raleigh. Dr. Seneca is a recent graduate of the University and interested in the grasses of the dunes of the Outer Banks. He will also teach ecology in the Departments of Botany and Zoology.

William H. Hatheway has been appointed Adjunct Professor in the Department of Botany, North Carolina State University, Raleigh. Dr. Hatheway is developing a research program in quantitative ecology and taxonomy, using the facilities of the Triangle Universities Computing Center. He is a former director of the Organization for Tropical Studies, and a member of the Rockefeller Foundation Staff in Columbia and Mexico. His interests are in tropical botany and he has spent the last two years working in Costa Rica.

The current faculty of Mars Hill College, Mars Hill, North Carolina, includes **Cornelia Ann Serota**, M.S. North Texas State University, interested in cytogenetics; **Fred H. Diercks**, Sc. D., University of Pittsburgh; **Norman E. Garrison**, M.A. Wake Forest University, interested in embryology; **Joseph R. Taylor**, Ed. D., Auburn University; and **L. M. Outten**, Ph.D., Cornell University, interested in the natural history of the lower vertebrates. Dr. Outten is chairman of the department and announces that Biology is now a required course for all students as a part of the development of a core curriculum for the general education program.

Eugene Jones has been appointed Associate Professor of Biology, University of South Alabama, Mobile. Dr. Jones received his Ph.D. from the University of North Carolina and does his research in protozoology. **Donald Linzey** has been appointed Assistant Professor of Biology. Dr. Linzey received his degree from Cornell University with research in mammalogy. **Harrison Lynn** has been named Assistant Professor of Biology. Dr. Lynn's Ph.D. was awarded by the University of Georgia, with research in microbiology.

W. D. Buchanan, has joined the faculty of Atlanta [Georgia] University. He will be Part-time Visiting Professor of Biology and teach graduate courses in entomology and serve as research supervisor. Dr. Buchanan was formerly associated with the U. S. Forestry Service as an entomologist.

Two new members will join the faculty of the Department of Biology, University of Miami, Coral Gables, Florida. **Howard J. Teas**, formerly Chairman of the Division of Biological Sciences at the University of Georgia, will join the department as a full Professor. Dr. Teas has been a visiting professor at Miami during the last academic year. His research interests have been in the area of plant biochemistry and genetics. He is

a member of the board of the Organization for Tropical Studies and of the Consultant's Bureau, Commission on Undergraduate Education in Biological Sciences. One of the major responsibilities of his new job will be to coordinate the department's interdisciplinary ecology program. **Peter Luykx** will become Assistant Professor of Biology. Dr. Luykx's research interests are in the area of cell reproduction, heredity, and growth. Following receipt of his degree from the University of California, Berkeley, in 1964, Dr. Luykx was Assistant Professor of Zoology, University of Minnesota. He will supervise the department's electron microscope facility.

James H. Gregg, Professor of Zoology, University of Florida, Gainesville, has received an NIH Research Career Development Award for an additional five years to continue his research on the development of the cellular slime molds.

E. Clifford Johnson has joined the Department of Zoology, University of Florida, Gainesville, as Associate Professor. Dr. Johnson received his degree from the University of Texas and will teach a course in ecological genetics in addition to continuing his research on population genetics of damselflies.

Brian K. McNabb, Associate Professor of Zoology, University of Florida, Gainesville, has returned after a year's leave of absence spent in Brazil where he conducted research on the ecology and physiology of tropical bats. This research was sponsored by grants from NSF and the American Philosophical Society.

Paul R. Elliott, Assistant Professor of Zoology, University of Florida, Gainesville, has been appointed Assistant Dean for Pre-Professional Education of the Medical School. His concerns will be in the areas of pre-medical education and counseling and in relationships between the College of Medicine and other colleges at the University.

Archie F. Carr, Graduate Research Professor of Biology, University of Florida, Gainesville, has just published a new book, "So Excellent a Fishe: A Natural History of Sea Turtles." The book, written for the general reader, is based on the author's ten-year study of marine turtles and contains evaluations of the problems awaiting solution.

The News Editor regrets to report that he has been informed by his attorneys that **Gordon B. Woolcott**, Southwestern College, Georgetown, Texas, is deceased. No other details were provided.

Edward Brandt and his wife, **Faydine Brandt**, are joining the staff of the Biology Department, North Carolina Wesleyan College, Rocky Mount, as Assistant Professors; Mrs. Brandt will have a half-time appointment.

The Brandts have been appointed effective with the Spring Semester of 1968 and are in the graduate program of the Department of Biology, Florida State University, Tallahassee. In addition, Mr. Brandt will serve as assistant to the Academic Dean of the College.

New additions to the staff of the Department of Biology, Clark College, Atlanta, Georgia, include **Miriam Fryer**, BS-ASMT, Coordinator of Paramedical Studies; **Clyde Johnson**, Ph.D., Associate Professor of Physiology; **Charles Hubert**, Ph.D., Associate Professor of Embryology; and **Winfred Harris**, Ph.D., Associate Professor of Genetics. Mrs. Fryer directs a program in Medical Technology funded by a Title III grant of \$28,000 by the U. S. Office of Education. Dr. Johnson received a matching funds equipment grant of \$6,000 from NSF.

Scott M. Weathersby, Professor of Zoology, Louisiana Polytechnic Institute, Ruston, was elected to the office of President-elect of the Louisiana Academy of Sciences at its annual meeting in April.

Robert K. Burns has retired as Interim Professor of Biology, Bridgewater College, Bridgewater, Virginia.

David J. Brusick has joined the staff of Bridgewater College, Bridgewater, Virginia as Assistant Professor of Biology.

Three new assistant professors have been added to the Department of Biological Sciences at the University of Florida, Gainesville. **Jonathan Reiskind**, Ph.D., Harvard University; **Mary A. Heimerdinger**, Ph.D., Yale University; **Dana Griffin**, Ph.D., University of Tennessee.

After an 18 month leave of absence from the Department of Biological Sciences and Zoology at the University of Florida, Gainesville, **Dr. John H. Kaufmann** has returned from Australia. He has been conducting research on kangaroos under the sponsorship of an NSF grant.

Lewis Berner, Chairman of the Department of Biological Sciences, University of Florida, Gainesville, was awarded a plaque for his distinguished service on the faculty. The award was presented by The Florida Blue Key Honor Fraternity.

John McCrone has recently been appointed jointly as Associate Professor in the Biological Sciences and Zoology Departments, University of Florida, Gainesville. He will continue his research on the "venoms of the black widow spider" along with his teaching duties.

James L. Wolfe will join the faculty of the Department of Zoology, Mississippi State University, State College, as Assistant Professor on 1 February 1968. Following receipt of his Ph.D. from Cornell in 1966, Dr. Wolfe served as Assistant Professor of Biology at the

University of Alabama. His research interests are in mammalian behavior and ecology.

New staff members at the University of Virginia, Charlottesville, include **Rolf Benzinger**, Assistant Professor of Biology; **Fred A. Diehl**, Assistant Professor of Biology; and **Robert Kretsinger**, Associate Professor of Biology. Dr. Benzinger received his doctorate from Johns Hopkins University and served previously as a Postdoctoral Fellow in Munich, Germany, and Geneva, Switzerland; his research interests are in biochemical genetics and microbiology. Dr. Diehl received his doctorate from Western Reserve University and served as an Instructor at the same institution; he is interested in development and physiology of the lower invertebrates, especially Cnidaria. Dr. Kretsinger, who received his doctorate from the Massachusetts Institute of Technology, comes to the University after service as a Research Fellow at the Helen Hay Whitney Foundation, Cambridge, England, and Geneva, Switzerland.

Robert Arking, a graduate of Temple University, is a post-doctoral fellow at the University of Virginia, Charlottesville, from June 1967 to May 1968. His research interests are in developmental and biochemical genetics of *Drosophila*. **Gerda Schwabl**, who received her doctorate from the Universität Wien, Austria, is also a post-doctoral fellow. Her appointment began in January, 1967, and her research interests lie in genetics.

Melvin L. Conrad, formerly at Oxford College of Emory University, Oxford, Georgia, has accepted a position in the Department of Biology at Northeastern Missouri State College, Kirksville.

J. F. Landt, Associate Professor of Biology, has been appointed Chairman of the Division of Mathematics and Natural Sciences at the Oxford College of Emory University, Oxford, Georgia.

William M. Leach has been selected to head the Radiation Cytology Laboratory of the Radiation Bio-Effects Program, National Center for Radiological Health, Rockville, Maryland. Dr. Leach came to the Program from the University of Tennessee, Knoxville, in September 1966, as a research biologist. The Center is part of the U. S. Public Health Service.

Leland Shanor, Professor and Chairman, Department of Botany, University of Florida, Gainesville, Florida, has been appointed to the Board of Governors of CRICISAM (Center for Research in College Instruction of Science and Mathematics), located in Tallahassee, Florida. His appointment was effective September 29, 1967. Other biologists on the Board of Governors of CRICISAM are: **Joshua R. C. Brown**, Department of Zoology, University of Maryland, College Park, Md., **T. W. Johnson, Jr.**, Department of Botany, Duke University, Durham, N. C., **George C. Kent**, Department of Zoology and Physiology, Louisiana State University, Baton Rouge,

La., and **H. F. Robinson**, Administrative Dean for Research, North Carolina State University, Raleigh, N. C.

C. W. Hart, Jr. and **Dabney G. Hart**, Academy of Natural Sciences of Philadelphia, have recently returned from Australia and New Zealand where they collected ostracods and worked at the University of Canterbury in Christchurch, N. Z. and at the Australian Museum in Sydney. En route Mr. Hart gave a seminar on entocytherid ostracods at the University of Hawaii, and also collected crayfishes and their associated ostracods which have been introduced there from the Southeast.

Martin D. Young, Gorgas Memorial Laboratory, Panama has been appointed a Member of the Parasitic Disease Commission, Armed Forces Epidemiological Board, Washington, D. C., and also as Professor Ad-Honorem, Tropical Medicine and Clinical Hematology, University of Panama.

Neal Foster of the Academy of Natural Sciences recently travelled to Jamaica to collect certain species of endemic cyprinodont fishes for laboratory studies. Working closely with personnel of the Institute of Jamaica at Kingston, he was very successful. The live stocks of three species of poeciliid (live-bearing) forms are now being studied by **Luis Rivas** at the Biology Department of the University of Miami (Florida) and two species of cyprinodontid (egg-laying) forms by Dr. Foster at the Limnology Department of the Academy of Natural Sciences of Philadelphia.

About Institutions

The **Savannah River Ecology Laboratory**, Aiken, South Carolina, recently conducted a very successful open house for the faculty and graduate students of the University of Georgia. Included among the tours were visits to areas not normally open to the general public.

The **University of the South**, Sewanee, Tennessee, has a \$2-million science facility under construction. The new building, scheduled for occupancy in September 1968, will house the Departments of Biology, Chemistry, Physics and Psychology.

Kuhn Science Building at **Converse College**, Spartanburg, South Carolina is now occupied. Most of the ground floor of this million dollar facility is devoted to the Department of Biology and \$20,000 worth of new equipment has been provided for animal physiology.

The Department of Botany, **Duke University**, Durham, North Carolina, has received a grant from NSF for graduate assistantships in plant systematics. Assistantships will be awarded on a competitive basis. Financial support includes a stipend, travel and subsistence for domestic and foreign field work, and costs for capital equipment and supplies.

Duke University, Durham, North Carolina, has been elected a member institution of the Organization for Tropical Studies, based in Costa Rica. **Donald E. Stone**, Associate Professor of Botany, has been named OTS board member representative.

The Department of Botany, **Duke University**, has established a four-acre experimental plot for graduate and staff research and teaching in ecology, physiology and biosystematics. The plot includes a laboratory building, a permanent weather station and other pertinent facilities. A portion of the costs were borne by a grant from the Special Facilities Program of NSF.

The Department of Zoology and Physiology, **Louisiana State University**, Baton Rouge, has established a Hemophilia Research Laboratory. The laboratory has a colony of dogs in which hemophilia is manifest in both sexes. The laboratory is under the direction of **H. Bruce Bondreanx** and **Blanche E. Jackson**.

A new \$2-million science facility at **Hampden-Sydney College**, Hampden-Sydney, Virginia, will provide new quarters for the Department of Biology. Occupancy is scheduled for Summer, 1968, and the facilities will include modern teaching laboratories, private faculty research quarters, a walk-in cold room and climate controlled animal and instrument rooms.

The Department of Biology, **Hampden-Sydney College**, Hampden-Sydney, Virginia, is undertaking a revision of its curricula. Some innovations will include an examination of auto-tutorial teaching methods, an interdisciplinary science program designed to separate B.A. candidates from B.S. candidates and the introduction of courses that lie at the interface of biology and theology and biology and political science. The revision is supported, in part, by NSF through its College Science Improvement Program.

The biology faculties of six colleges and universities in western Kentucky and Tennessee are in the initial stage of organizing a regional biological association. The purposes are to exchange ideas about teaching and research, promote fellowship among local biologists with common problems, examine undergraduate biology curricula, and procure lecture programs of interest. The first meeting at the **University of Tennessee, Martin**, was well attended and generated enthusiasm. A steering committee was elected to implement the organization: **C. M. Chandler**, Bethel College, McKenzie, Tennessee (chairman); **Lois Lord**, Lambuth College, Jackson, Tennessee; **Morgan Sisk**, Murray State University, Murray, Kentucky; **Charles Smith**, Paducah Junior College, Paducah, Kentucky; **Elsie Smith**, Union University, Jackson, Tennessee; and **Jim Trentham**, University of Tennessee, Martin. Among current plans are a cooperative biological station for use by the member institutions and quarterly meetings at one of the member institutions.

In August 1967, a new science building providing facilities for teaching all the natural sciences was inaugurated at **Belmont Abbey College**, Belmont, North Carolina. The new facilities and additional courses implement the inauguration of a major in biology in the next academic year. Also major sequence courses in physics and mathematics are made possible by the new building.

North Carolina State University, Raleigh, has been awarded a grant of \$40,000 by the Cotton Producers Institute. The grant will become effective 1 January 1968 and will initiate a research program to develop physical, chemical and biological data needed to establish specifications for improved cotton planting methods and machinery. The Department of Botany will participate through research programs on the physiology and biochemistry of cotton seed germination and ultrastructural studies of various phases of cotton seed germination and development. Principal Investigators are **R. J. Downs** and **G. R. Noggle**. Provisions are made for pre-doctoral and post-doctoral work. Other cooperating departments are Biological and Agricultural Engineering and Soils.

The Department of Botany, **North Carolina State University**, Raleigh, has added a second electron microscope (Siemens IA) to its new electron microscope laboratory. The older microscope is used in the beginning biology course, as well as advanced courses and faculty research. The fully equipped laboratory is under the direction of Royall T. Moore of the Department of Botany and Rod McCurry, EM Technician.

Yancey Hall, **Spring Hill College's** (Mobile, Alabama) new half million dollar biology building will be dedicated 14 January 1968. The building is named in honor of **Father Patrick H. Yancey, S.J.**, who became Professor and Chairman of Biology, Emeritus in 1966. Among Father Yancey's many accomplishments are appointment to the original Board of NSF by President Truman in 1950 and the Outstanding Teacher Award from ASB in 1963. The principal speaker at the dedication will be Dr. Louis Levin, Associate Director of NSF, a former classmate of Father Yancey. A. F. Hemphill succeeded Father Yancey as Chairman of Biology.

An RCA EMU-4 electron microscope was recently installed in the Department of Biology, **Atlanta [Georgia] University**. The microscope will be used for research on fine structure of larval connective tissue cells, spores and spore development in imperfect fungi, and xylem elements of elm infected with *Ceratocystis ulmi*.

The first of two units of the new Life Sciences Complex, **University of Florida**, Gainesville, is scheduled for occupancy around 1 March 1968. This new facility will provide 25 research laboratories, offices for the staff of the Department of Zoology, the Department of Biologi-

cal Sciences and the Division of Biological Sciences and will house in excess of 20 graduate students.

Bridgewater College, Bridgewater, Virginia, announces that a new laboratory equipped for work in biochemistry, cell physiology, and microbiology has been put into use this session.

The **University of Virginia** announces that eight graduate courses emphasizing field biology will be given at the Mountain Lake Biological Station this summer. Three types of National Science Foundation awards are available for research and study at the Station: (1) Post-doctorate for research, stipend \$1300; (2) Pre-doctorate for supervised research, stipend \$500; and (3) Post-graduate for training in field biology, stipend \$400. Preference is given for studies concerned with the biota of the region. Application blanks for these awards may be secured from the Director, Department of Biology, University of Virginia, Charlottesville, Virginia 22903 and must be submitted before May 1, 1968.

Research scientists of **Oak Ridge National Laboratory Biology Division** are participating, in cooperation with the University of Tennessee, in the operation of the new Graduate School of Biomedical Sciences at Oak Ridge, Tennessee. The school has a small full time University of Tennessee faculty and a large shared faculty of Biology Division personnel. While plans are being developed for a building on land adjoining the Biology Division, the school is housed within the Division in rented space which includes student lounge and office area, as well as teaching facilities. The first students entered in September, 1967, and will do their Ph.D. thesis research in the Division under the supervision of senior staff members. Areas of study include: microbiology, cell physiology, immunology, biochemistry, biophysics, cytology, radiation biology, virology, developmental biology, carcinogenesis, plant physiology and photosynthesis, experimental pathology, genetics (including mammalian), and problems of aging.

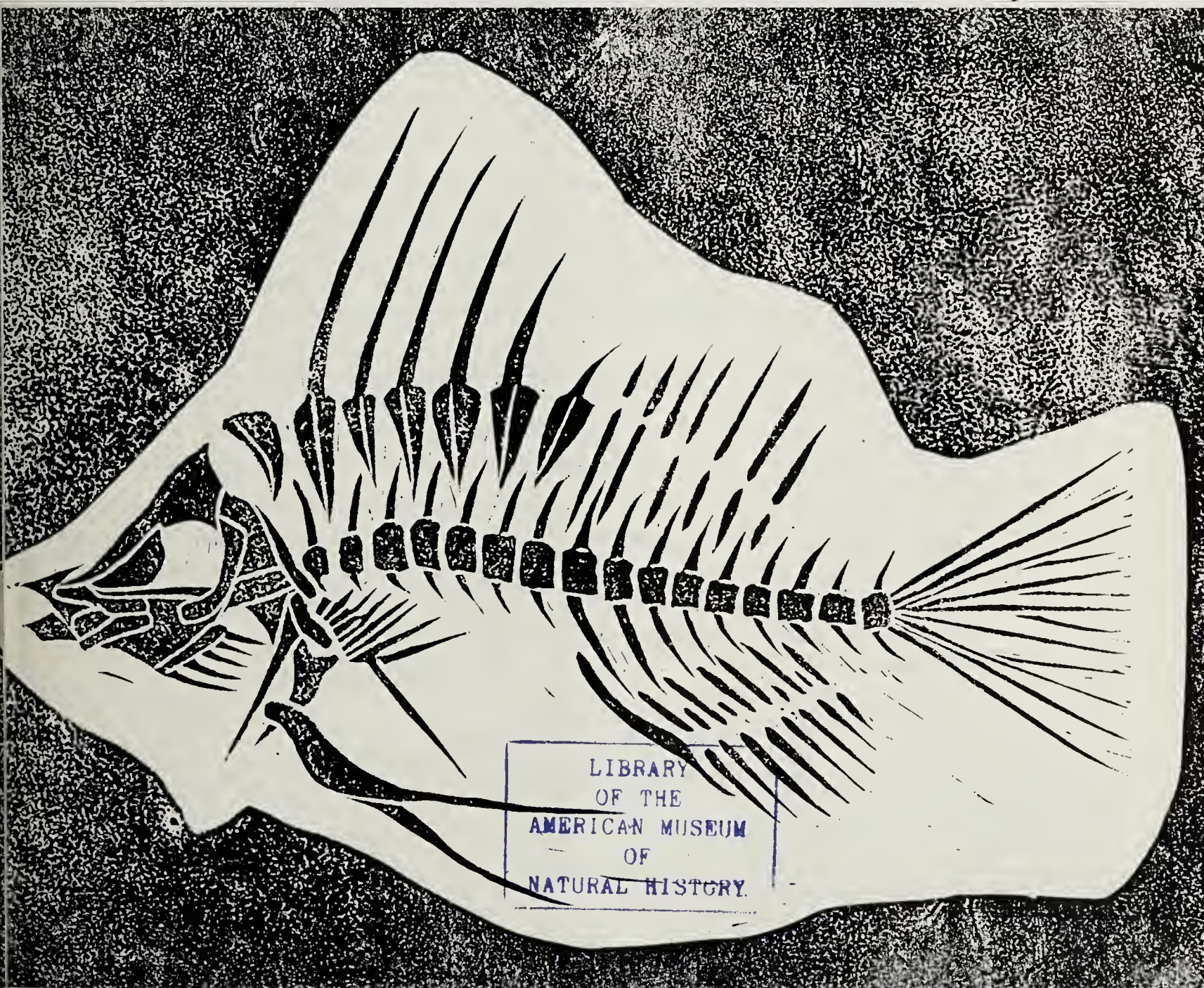
Inquiries are welcomed, and should be addressed to: **R. C. Fuller**, Director, Graduate School of Biomedical Sciences, Oak Ridge National Laboratory Biology Division, P. O. Box Y, Oak Ridge, Tennessee.

Tentative plans are being made for an Annual W. A. Murrill Mycological Foray, possibly to be held each spring in conjunction with the meeting of the Association of Southeastern Biologists. Since the ASB will be meeting this year at the University of Georgia, April 19 and 20, arrangements are being made for collecting trips to include one full day April 17 and one half-day April 18. Dr. Richard T. Hanlin, Department of Plant Pathology and Plant Genetics, University of Georgia, Athens, Georgia, is in charge of local arrangements. For additional information, contact **Dr. Hanlin** or **Dr. Henry C. Aldrich**, Department of Botany, University of Florida, Gainesville.

The ASB BULLETIN

Volume 15, Number 2

April 1968



LIBRARY
OF THE
AMERICAN MUSEUM
OF
NATURAL HISTORY.

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Margaret Y. Menzel, Dept. of Biological Sciences, Florida State Univ., Tallahassee, Fla. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. John Carpenter, Dept. of Zoology, Univ. of Kentucky, Lexington, Kentucky. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Harold J. Humm, University of South Florida
Retiring President — Elsie Quarterman, Vanderbilt University
President Elect — Robert B. Short, Florida State University
Vice-President — Margaret Y. Menzel, Florida State University
Secretary — Dorothy L. Crandall, Randolph Macon Woman's College
Treasurer — John Carpenter, University of Kentucky
Executive Committee — Frederick T. Wolf, Vanderbilt University; Julian T. Darlington, Southwestern at Memphis; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — Position Vacant

Florida — John D. McCrone, University of Florida

Georgia — Fred K. Parrish, Georgia State College

Louisiana — Harry J. Bennett, Louisiana State University

Mississippi — Joseph Fitzpatrick, Mississippi State University

North Carolina — C. J. Umphlett, University of North Carolina

South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College

Tennessee — Donald Caplenor, George Peabody College

Virginia — Harry L. Holloway, Jr., Roanoke College

West Virginia — Earl L. Core, West Virginia University

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman

CONTENTS

Association Affairs	18
Program of the 29th Annual Meeting of the Association of Southeastern Biologists	19
Conference on Distributional History of Invertebrate Biota of Southern Appalachians	28
Abstracts of Papers Presented at the 29th Annual Meeting of the Association of Southeastern Biologists	29
News of Biology in the Southeast	62

COVER ILLUSTRATION: Linoleum-block print of a fish skeleton, executed by Dr. Selwyn Roback of the Academy of Natural Sciences of Philadelphia. This print is an artists interpretation of a detailed pen and ink drawing of the skeleton of *Parahollardia lineata* (Longley) that appeared on the cover of the ASB Bulletin in October, 1966. The 1966 drawing was by Dr. James Tyler, also of the Academy of Natural Sciences of Philadelphia.

ASSOCIATION AFFAIRS

The Nominating Committee has selected the following slate of nominees for the various ASB offices that will be vacated this year. Voting will take place at the Business Meeting of the ASB, which will be held at 11:45 A.M., Friday, April 19, in the auditorium of the Georgia Center.

President Elect

John Carpenter

Margaret Menzel

Vice-President

James Hardin

Herbert A. McCullough

Treasurer

David Cotter

J. C. McDonald

Executive Committee

G. T. Cowley

Dolores Dundee

A. E. Radford

John D. McCrone

Program of the 29th Annual Meeting of the Association of Southeastern Biologists

University of Georgia, Athens, Georgia

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southern Appalachian Botanical Club, Southern Section of the American Society of Plant Physiologists, Southeastern Division of the American Society of Ichthyologists and Herpetologists, and the Southeastern Region of Beta Beta Beta National Honorary Biological Society.

WEDNESDAY, APRIL 17

8:00 A.M. **Field Trip:** All day mycological foray to mountains of North Georgia. Information available from Dr. Richard T. Hanlin, Department of Plant Pathology and Plant Genetics, University of Georgia.

THURSDAY, APRIL 18

- 8:00-12:00 **Field Trip:** Mycological foray in vicinity of Athens. Information available from Dr. Richard T. Hanlin, Department of Plant Pathology and Plant Genetics, University of Georgia.
- 8:00- 5:00 **Biology Departments Open to Visitors:** Information and directions may be obtained at the registration desk or the departments.
- 8:30-11:00 **Paper Sessions:**
A.M. *Plant Physiology*
Session 1A. Room 404C Biological Sciences.
Session 1B. Room 404D Biological Sciences.
- 11:00 A.M. **Business Meeting, Southern Section of American Society of Plant Physiologists:** Room 404D Biological Sciences.
- 1:30 **Executive Committee Meeting, Association of Southeastern Biologists:** Room J, Georgia Center.
- 2:00- 5:00 **Symposium:** Plant Physiology, Session 2. Root-Soil Relationships. Room 404E, Biological Sciences.
- 2:00-11:00 **Exhibits:** Lobby Lounge, Georgia Center.
P.M.
- 3:00- 5:00 **Guided Tour of Southeastern Water Laboratory on College Station Drive:** Under direction of Dr. H. Paige Nicholson.
- 4:00 **Tour of Local Laboratory and Field Research Facilities:** Conducted by Dr. John McGinnis and Dr. Eugene Odum. Meet at main entrance of Georgia Center.
- 4:00- 7:15 **A.S.B. Registration:** Lobby Lounge, Georgia Center.
and
after General Session until 10:00 **Placement Service Registration:** Lobby Lounge, Georgia Center.
- 6:00 **Beta Beta Beta Smorgasbord:** Georgian Hotel.
- 7:30 **A.S.B. General Session:** Auditorium, Georgia Center. Dr. Harold J. Humm, presiding.
Address of Welcome: Dr. Fred C. Davison, President, University of Georgia.
Response: Dr. Harold J. Humm, President, The Association of Southeastern Biologists.
Invitational Address: "Our Taste Receptors." Dr. Lloyd M. Beidler, Professor of Biophysics and Director of the Sensory Research Center, Florida State University.
Smoker: Lobby and Patio, Georgia Center.

FRIDAY, APRIL 19

- 7:00 **Breakfast and Business Meeting, Southern Appalachian Botanical Club:** Banquet Area, Georgia Center.
- 8:00- 5:00 **Biology Departments Open to Visitors:** Information and directions may be obtained at the registration desk or the departments.
- 8:00-11:45 **A.S.B. Registration:** Lobby Lounge, Georgia Center.
A.M.
- 8:00-10:00 **Placement Service Registration:** Lobby Lounge, Georgia Center.
A.M.
- 8:00- 5:00 **Exhibits:** Lobby Lounge, Georgia Center.
- 8:00- 9:00 **Beta Beta Beta Registration:** Main Lobby, Biological Sciences.
A.M.
- 8:30-11:30 **Paper Sessions:**
Plant Physiology — Session 3A, Room G, Georgia Center. Session 3B, Room K, Georgia Center. 11:00 A.M. Special Paper, Room K, Georgia Center.
Plant Taxonomy — Auditorium, Georgia Center.
Cryptogamic Botany — Room A, Georgia Center.
Plant Autecology and Aquatic Biology — Room B, Georgia Center.
Ecology — Room L, Georgia Center.
Animal Physiology — First Floor Conference Room, Georgia Center.
Ichthyology and Herpetology — Basement Auditorium, Georgia Center.

- 9:00-11:45 A.M. **Beta Beta Beta Paper Sessions:**
 Eastern Division — Room 404C, Biological Sciences.
 Western Division — Room 404D, Biological Sciences.
- 11:00 **Business Meeting, Southeastern Division of American Society of Ichthyologists and Herpetologists:** Basement Auditorium, Georgia Center.
- 11:45 **Business Meeting, Association of Southeastern Biologists:** Auditorium, Georgia Center.
- 1:00- 2:00 **Beta Beta Beta General Meeting:** Room 404C, Biological Sciences.
- 1:45 **Business Meeting, Southeastern Section, Botanical Society of America:** Auditorium, Georgia Center.
- 2:00- 5:30 **Paper Sessions:**
Plant Physiology — Session 4A, Room F, Georgia Center. Session 4B, Room G, Georgia Center.

- Morphogenesis and Invertebrate Zoology* — Room L, Georgia Center.
Parasitology and Histology — First Floor Conference Room, Georgia Center.
Genetics, Cytology, and Plant Morphology — Room A, Georgia Center.
Ecology — Room K, Georgia Center.
Plant Ecology — Auditorium, Georgia Center.
- Ichthyology and Herpetology* — Basement Auditorium, Georgia Center.
- 7:00 P.M. **A.S.B. Banquet and Presentation of Awards:**
 Banquet Area, Georgia Center.
 Association Research Prize. Sponsored by Carolina Biological Supply Company.
 Meritorious Teaching Award. Sponsored by Will Scientific, Inc., Georgia.
 Past President's Address: Dr. Elsie Quarterman—"Cedar Glades—Challenge and Opportunity." Auditorium, Georgia Center.

SATURDAY, APRIL 20

- 8:00 A.M. **Breakfast and Meeting, Southern Section of the American Society of Plant Physiologists.**
- 8:00 A.M. **Trip to Savannah River Ecology Laboratory at the AEC Savannah River Plant near Augusta, Georgia.** Led by Robert J. Beyers. Registration must be prior to Thursday, April 18.
- 8:00 A.M. **Field Trips:** Details at registration desk. Please sign up during registration.
1. Aquatic and terrestrial habitats at Echols Mill Granitic Outcrop. Led by Dr. Samuel Jones and Dr. J. Bruce Wallace.
 2. Ichthyological trip north of Gainesville, Georgia. Organized by Dr. John P. Kerr.
 3. Herpetological trip in the headwaters of the Ogeechee River. Organized by Dr. John P. Kerr.
- 8:00-12:00 noon **Biology Departments Open to Visitors:** Information and directions may be obtained at the registration desk or the departments.
- 8:00-11:00 **Exhibits:** Lobby Lounge, Georgia Center.
- 8:30 A.M. **Executive Committee Meeting, Association of Southeastern Biologists:** Room J, Georgia Center.

SCHEDULE OF PAPER SESSIONS

THURSDAY MORNING — APRIL 18

PLANT PHYSIOLOGY

SESSION 1A. Absorption, Mineral Nutrition, and Translocation. Room 404C, Biological Sciences

Presiding: Dr. Joseph C. O'Kelley, University of Alabama

- | | | | |
|------|---|-------|---|
| 8:30 | 1. SUTTON, DAVID L., D. W. JONES, C. W. LAUGLIN AND M. G. HALE (Virginia Polytechnic Institute). Absorption of 2-chloro-4, 6-bis (ethylamino) -s-triazine (simazine) by Excised Roots of <i>Hordeum vulgare</i> L. (var. Wong). | 9:30 | 5. LAHAYE, PHILIP A. AND JAMES G. GOSSELINK (Louisiana State University). Dual Mechanisms of Phosphorus Uptake in <i>Euglena gracilis</i> Klebs. |
| 8:45 | 2. SUTTON, D. L. AND C. L. FOY (Virginia Polytechnic Institute). Influence of Diquat, Paraquat and Several Surfactants on the Loss of Betanin from Beet Root Discs <i>in Vitro</i> . | 9:45 | Recess |
| 9:00 | 3. SHEAR, G. M. (Virginia Polytechnic Institute). Calcium Translocation in Bean Seedlings. | 10:00 | 6. JOHANSON, LAMAR AND H. E. JOHAM (Texas A and M University). Effect of Sodium Substitution for Calcium on the Translocation of Carbohydrates in Excised Cotton Roots. |
| 9:15 | 4. SCHMID, WALTER E. (Southern Illinois University). On the Effects of DMSO in Cation Transport by Excised Barley Roots. | 10:15 | 7. JOHAM, H. E. AND M. C. PAREKH (Texas A and M University). Sodium and Magnesium Interactions in Cotton Nutrition. |
| | | 10:30 | 8. BONDS, ELDON AND JOSEPH C. O'KELLEY (Tennessee Wesleyan College and University of Alabama). Effects of Ca and Sr on Maize Seedling Primary Roots. |

PLANT PHYSIOLOGY

SESSION 1B. Growth Regulators

Room 404D, Biological Sciences

Presiding: Dr. Page W. Morgan, Texas A and M University

- | | | | |
|------|---|-------|---|
| 8:30 | 9. RIZK, TAWAKOL Y. AND W. C. NORMAND (Louisiana State University). Histological and Mitotic Changes in Excised Cotton Roots in Response to Trifluralin or Nitratin Treatments. | 9:45 | 14. HENDERSON, JAMES H. M. AND CECELIA PHILLIPS (Tuskegee Institute). Extraction and Partial Identity of Unknown Phenolic Derivative in <i>Avena</i> Coleoptile. |
| 8:45 | 10. NORRIS, W. E. JR. (Southwest Texas State College). The Reversal of Ethionine-Induced Inhibition of Elongation of <i>Avena</i> Coleoptiles by Various Compounds. | 10:00 | Recess |
| 9:00 | 11. MORGAN, PAGE W. (Texas A and M University). Stimulation of Ethylene Production and Abscission. | 10:15 | 15. FOY, C. L. AND D. E. SEAMAN (Virginia Polytechnic Institute and Syracuse University). Residue Studies with a ^{14}C -Labeled Endothall Defoliant Formulation in Cotton. |
| 9:15 | 12. McHALE, JANIECE S. AND LEWIS D. DOVE (Tulane University). Anomalous Responses of Young Tomato Leaves to Phytokinin Treatment. | 10:30 | 16. COATS, G. E. AND C. L. FOY (Virginia Polytechnic Institute). Effect of Tween 80 and DMSO on the Absorption and Translocation of Three Phloem-Mobile Herbicides in <i>Verbascum thapsus</i> L. |
| 9:30 | 13. JONES, D. W. AND C. L. FOY (Virginia Polytechnic Institute). Tracer Studies with Three ^{14}C -Labeled Herbicides, DMSO and Tween 80 in Black Valentine Bean. | 10:45 | 17. BEYER, ELMO JR. AND PAGE W. MORGAN (Texas A and M University). Effects of Ethylene on Auxin Transport and Abscission. |

THURSDAY AFTERNOON — APRIL 18

PLANT PHYSIOLOGY

SESSION 2. Symposium: Root-Soil Relationships.

Presiding: Dr. Lewis D. Dove, Tulane University

- | | | |
|------|---|--|
| 2:00 | Ion Accumulation by Plants, James E. Leggett, Mineral Nutrition Laboratory, USDA, ARS, SWCRD, Beltsville, Maryland. | city, Durham, North Carolina. |
| | Roots as Absorbing Surfaces, Paul J. Kramer, Department of Botany, Duke University, | Soil Conditions that Influence Plant Root Development and Function, Robert W. Pearson, USDA, Alabama Agricultural Experiment Station, Auburn, Alabama. |

FRIDAY MORNING — APRIL 19

PLANT PHYSIOLOGY

SESSION 3A. Enzymology

Room G, Georgia Center

Presiding: Dr. Aubrey W. Naylor, Duke University

- | | | | |
|------|--|-------|---|
| 9:00 | 18. BEMILLER, J. N., D. O. TEGTMEIER, AND A. J. PAPPELIS (Southern Illinois University). Non-Induced Cellulolytic Enzymes of <i>Diplodia zeae</i> (Schw.) Lev. | 10:00 | tamic Acid Decarboxylase from <i>Cucurbita pepo</i> L. cv Summer Crookneck. |
| 9:15 | 19. WOLF, FREDERICK T. (Vanderbilt University). Enzymatic Activities in Leaves of Light-grown and Dark-grown Wheat Seedlings. | 10:15 | Recess |
| 9:30 | 20. RIZK, TAWAKOL Y. AND W. C. NORMAND (Louisiana State University). Changes with Plant Age in the Activities of Two Invertases of Louisiana Sugarcane. | 10:30 | 22. HABER, ALAN H. AND LARRY L. TRIPLETT (Oak Ridge National Laboratory). Cancelling Errors in the Quantitative Determination of Alpha-Amylase Activity. |
| 9:45 | 21. MACKEY, BRENDA LEE AND AUBREY W. NAYLOR (Duke University). Studies on Glu- | 10:45 | 23. GARRARD, L. A. AND T. E. HUMPHREYS (University of Florida). Phosphofructokinase and Glycolysis in the Corn Scutellum. |
| | | | 24. SCHWARTZ, OTTO J. AND G. R. NOGGLE (North Carolina State University). The Preliminary Characterization of Cholinesterase Activity from Etiolated Pea Seedlings (<i>Pisum sativum</i> var. Alaska). |

PLANT PHYSIOLOGY

SESSION 3B. Water Relations

Room K, Georgia Center

Presiding: Dr. James E. Pallas, Jr., Southern Piedmont Research Center

- | | |
|---|---|
| <p>9:00 25. WEATHERSPOON, CHARLES P. (Duke University). The Effects of Temperature on Water Potential and Water Movement in Plants.</p> <p>9:15 26. McMICHAEL, BOBBIE L. AND ROBERT D. POWELL (Texas A and M University). The Effect of Temperature and Moisture on Flowering and Boll Development in <i>Gossypium hirsutum</i> L. (Cotton).</p> <p>9:30 27. LORIO, PETER L. JR. AND JOHN D. HODGES (Southern Forest Experiment Station). Oleoresin Exudation Pressure and Relative Water Content of Inner Bark as Indicators of Moisture Stress in Loblolly Pine.</p> <p>9:45 28. LAWLOR, DAVID W. (Duke University). Analysis of Polyethylene Glycol in Plant Material and its Absorption by Corn, Bean and Cotton.</p> | <p>10:00 Recess</p> <p>10:15 29. HELSETH, FRANK A. (Southeastern Forest Experiment Station). Manometric Measurement of Turgor Pressures in the Bole of Slash Pine.</p> <p>10:30 30. BARRS, HENRY D. AND BETTY KLEPPER (Duke University and C.S.I.R.O., Australia). Causes of Cyclic Changes in Transpiration in Pepper, Sunflower and Cotton Plants.</p> <p>10:45 31. BARRS, HENRY D. (Duke University and C.S.I.R.O., Australia). Water-Use Efficiency during Cyclic Variation in Gas Exchange in Cotton and Pepper.</p> <p>11:00 32. HELMERS, HENRY (Duke University). The Phytotron: A Tool for Botanical Research in the Southeast.</p> |
|---|---|

PLANT TAXONOMY

Auditorium, Georgia Center

Presiding: Dr. Robert W. Long, University of South Florida

- | | |
|--|---|
| <p>8:30 33. REYNOLDS, JOHN D. (Richmond Professional Institute). Infrared Spectrophotometry: A Plant Taxonomic Tool.</p> <p>8:43 34. SHETLER, STANWYN G. (Smithsonian Institution). The Computer in the Flora North America Project.</p> <p>8:56 35. LAMPTON, ROBERT K. (West Georgia College). The Moss Flora of Georgia. Interesting Species Which Have Been Found in the State.</p> <p>9:09 36. PARKS, JAMES C. (Vanderbilt University). Hybridization in the Genus <i>Melanthera</i> Rohr (Compositae).</p> <p>9:22 37. WOFFORD, B. EUGENE AND WILLIAM H. ELLIS (University of South Alabama and Austin Peay State University). A Preliminary Biosystematic Study of <i>Erythronium americanum</i> Ker (Liliaceae) in the Southeastern United States.</p> <p>9:35 38. EGGERS, DONNA MARIE (Vanderbilt University). Genetic Fruit Polymorphism in <i>Valerianella umbilicata</i> (Sull.) T. & G. (Valerianaceae).</p> | <p>9:48 39. DRAPALIK, DONALD J. (University of North Carolina). Natural and Artificial Pollination in Southeastern U. S. <i>Matelea</i> (Asclepiadaceae).</p> <p>10:01 40. PULLEN, THOMAS M., SAMUEL B. JONES, JR. AND J. RAY WATSON, JR. (University of Mississippi, University of Georgia, and Mississippi State University). A Preliminary Report on the Vascular Flora of Mississippi.</p> <p>10:14 41. CLARK, ROSS C. (University of North Carolina). The Woody Flora of Alabama.</p> <p>10:27 42. MATTHEWS, J. F. AND W. H. MURDY (University of North Carolina at Charlotte and Emory University). A Study of <i>Isoetes</i> Common to the Granite Outcrops of the Southeastern Piedmont.</p> <p>10:40 43. BROWNE, EDWARD T. JR. (Memphis State University). Correlation of Environmental Factors and Known Distribution of <i>Taxus canadensis</i> Marsh, in Kentucky.</p> <p>10:53 44. SHARP, A. J. (University of Tennessee). Tennessee Plants of Interest.</p> |
|--|---|

CRYPTOGAMIC BOTANY

Room A, Georgia Center

Presiding: Dr. M. B. Huneycutt, University of Mississippi

- | | |
|--|---|
| <p>8:30 45. McDONALD, JAMES C. (Wake Forest University). Fruiting Myxobacteria from the North Carolina Seacoast.</p> <p>8:43 46. BLAND, CHARLES E. (University of North Carolina). Ultrastructure of <i>Pilimelia annulata</i> (Actinoplanaceae).</p> <p>8:56 47. CLAUSZ, JOHN (University of North Carolina). A Technique for Counting Saprolegniaceous Propagules in a Water Sample.</p> <p>9:09 48. RISTANOVIC, BOSILJKA AND CHARLES E. MILLER (Ohio University). Experimental Taxonomy of Some Members of the Saprolegniaceae.</p> | <p>9:22 49. KOCH, WILLIAM J. (University of North Carolina). Flagellar Retraction in Posteriorly Uniflagellate Fungi.</p> <p>9:35 50. WHITE, JOSEPH C. AND LAFAYETTE FREDERICK (Atlanta University). Taxonomic Studies on the Genus <i>Dinemasporium</i>.</p> <p>9:48 51. HANLIN, RICHARD T. (University of Georgia). Uncommon Soil Fungi Isolated from Peanut Fruits in the Southeastern United States.</p> <p>10:01 52. FREDERICK, LAFAYETTE, CHESTER R. BENJAMIN, AND JOSEPH C. WHITE (Atlanta University and USDA, Beltsville, Maryland). Studies on Soil Fungi from West Pakistan.</p> |
|--|---|

- 10:14 53. BOSTICK, P. E. (Emory University). The Use of Glass Micro-beads in the Study of Soil Fungi.
- 10:27 54. HALE, MASON E. (Smithsonian Institution). Growth Rate of the Lichen *Parmelia caperata*.
- 10:40 55. OTT, DONALD WILLIAM (University of North Carolina). Unrecorded or Otherwise Unusual *Vaucheria* from North Carolina.
- 10:53 56. SMOSKY, JERRY AND G. T. COWLEY (University of South Carolina). Growth and Energetics of *Chlorella pyrenoidosa* Chick.
- 11:06 57. HURD, MAGGIE P. AND LAFAYETTE FREDERICK (Atlanta University). The Effect of Gibberellic Acid on Mycelial Growth and Toxin Formation in Isolates of *Ceratocystis ulmi*.

PLANT AUTECOLOGY AND AQUATIC BIOLOGY

Room B, Georgia Center

Presiding: Dr. Edward E. C. Clebsch, University of Tennessee

- 8:30 58. HICKS, VIOLET ANN (University of North Carolina). Autecological Study of Roadside and Field-Pasture Populations of *Helinium amarum* (Raf.) H. Rock.
- 8:43 59. MELLINGER, A. CLAIR (University of North Carolina). Causes of Endemism in *Viguiera porteri*.
- 8:56 60. BASKIN, JERRY M. AND CAROL CAUDLE (University of Florida and Vanderbilt University). Germination of 12 Species from the Middle Tennessee Cedar Glades.
- 9:09 61. CAUDLE, CAROL AND ELSIE QUARTERMAN (Vanderbilt University). Hydro-economy of *Astragalus tennesseensis* (Leguminosae).
- 9:22 62. FOSTER, WILLIAM A. AND LINDA STROUD (North Carolina State University). Utilizing the Pattern of Growth of *Juncus roemerianus* to Estimate Net Leaf Production.
- 9:35 63. WILLIAMS, RICHARD B. AND MARIANNE B. MURDOCH (Oak Ridge National Laboratory and U.S. Bur. Commercial Fisheries). Compartmental Analysis of Production and Decay of *Juncus roemerianus*.
- 9:48 64. TEAS, HOWARD J. AND FLORENCE MONTGOMERY (University of Miami and University of Georgia). Ecology of Red Mangrove Seedling Establishment.
- 10:01 65. DILLON, C. R. (University of North Carolina). Distribution and Production of the Macrobenthic Flora of a North Carolina Estuary.
- 10:14 66. NEUBERT, STEVE A. (University of Miami). Modern Carbonate Sediments: Algae and Marl Sediments in Coastal Marshes, Everglades National Park.
- 10:27 67. WOLF, FREDERICK A. (Duke University). Non-Petrified Fossil Spores in Sediments.
- 10:40 68. MEYER, KENNETH A. (University of North Carolina). Seasonal Fluctuation of Phytoplankton Composition and Production in a Freshwater Lake.
- 10:53 69. RHOADS, PETER B. AND ROBERT POPE (University of Miami). A Comparison of Phytoplankton of Open Everglades and an Alligator Hole.
- 11:06 70. MARLAND, FREDERICK C. AND STUART E. NEFF (Marine Institute, University of Georgia and Virginia Polytechnic Institute). The Apparent Cultural Eutrophication of Mountain Lake, Virginia.
- 11:19 71. CRAWFORD, CLAUDE C. (North Carolina State University). Uptake of Amino Acids in Natural Water.

ECOLOGY

Room L, Georgia Center

Presiding: Dr. William D. Burbanck, Emory University

- 8:30 72. RITTENHOUSE, W. H. (University of North Carolina). A Functional Classification of Forest Litter Arthropods Based upon Response to Resource Enrichment.
- 8:43 73. TRAMER, ELLIOT J. (University of Georgia). Bird Species Diversity and Ecological Succession.
- 8:56 74. HAECKER, MARY H., ROBERT J. BEYERS AND MICHAEL H. SMITH (Savannah River Ecology Laboratory). A Colorimetric Method for Determining Oxygen Concentration in Terrestrial Systems.
- 9:09 75. ODUM, EUGENE P., GARY W. BARRETT AND H. RONALD PULLIAM (University of Georgia). Testing Pesticides at the Ecosystem Level.
- 9:22 76. BAMFORTH, STUART S. (Tulane University). Iron Neuston Communities.
- 9:35 77. STERN, MICHELE S. AND DANIEL H. STERN (Tulane University and Louisiana State University in New Orleans). A Limnological Study of the Invertebrates of a Tennessee Cold Springbrook.
- 9:48 78. PARRISH, FRED K. AND FELICIA H. HOLLINGSWORTH (Georgia State College). A Limnological Reconnaissance of the Eastern Prairies of the Okefenokee Swamp.
- 10:01 79. BLESSING, RONALD W. AND MICHAEL H. SMITH (Savannah River Ecology Laboratory). Supplementary Food and Population Dynamics of the Old-Field Mouse.
- 10:14 80. VAN HOOK, ROBERT I., JR. AND D. A. CROSLEY, JR. (Oak Ridge National Laboratory). Biological Assimilation and Turnover of Three Radioisotopes by Crickets (*Acheta domesticus*).
- 10:27 81. SMITH, K. L., JR., JAMES D. HOWARD AND TAYLOR MAYOU (University of Georgia and University of Iowa). Application of X-ray Radiography to the Study of Burrowing Marine Organisms.
- 10:40 82. SMITH, K. L., JR. (University of Georgia). Decapod Crustacean Burrows of Callinassids as Possible Paleoenviromental Indicators.
- 10:53 83. NELSON, GIDEON E. (University of South Florida). Some Attributes of an Amphioxus (*Branchiostoma caribaeum*) Population in Old Tampa Bay, Florida (Leptocardii, Amphioxi, Branchiostomidae).

ANIMAL PHYSIOLOGY

First Floor Conference Room, Georgia Center

Presiding: Dr. George C. Kent, Jr., Louisiana State University

- | | | | |
|------|---|-------|--|
| 8:30 | 84. CATCHING, CHARLES A. AND WILLIAM W. NORRIS, JR. (Northeast Louisiana State College). A Numerical Evaluation of the Cells of the Corpora Lutea of Pregnancy of the Golden Hamster (<i>Mesocricetus auratus</i> Waterhouse). | 9:48 | 90. BURSEY, ROBERT G. AND WILBUR A. WELLBAND (Medical College of Georgia). Experimental Demonstration of Lymphatic Blockage. |
| 8:43 | 85. KEITH, WILLIAM B. AND KENNETH I. H. WILLIAMS (The Worcester Foundation for Experimental Biology). The Conversion of Radioactive 17β -Estradiol to Urinary 2-Hydroxyestrone by Euthyroid, Hypo- and Hyperthyroid Hamsters. | 10:01 | 91. FOREMAN, CHARLES W. (University of the South). Hybridization of <i>Peromyscus</i> and Human Hemoglobins. |
| 8:56 | 86. JOHNSON, CLYDE EDGAR, JR. (Clark College). Comparative Physiology of Bovine and Porcine Spermatozoa. | 10:14 | 92. DOWDEN, BOBBY F. (Louisiana State University in Shreveport). Effects of Five Insecticides on the Oxygen Consumption of Bluegill Sunfish, <i>Lepomis macrochirus</i> . |
| 9:09 | 87. KUENZEL, WAYNE J. (University of Georgia). Ventromedial Hypothalamic Lesions and Their Effects on Fat Deposition and Other Physiological Phenomena in Migratory Birds. | 10:27 | 93. MOBBERLY, WILLIAM C. (Northeast Louisiana State College). Electrophoretic Analysis of the Molt-Inhibiting Hormone in Crawfish. |
| 9:22 | 88. MOORE, JACK H., DANIEL P. GRISWOLD, JR., CHARLES A. KELLEY AND DONALD J. DYKES (Southern Research Institute). Studies on the Metastasis of the Fortner Plasmacytoma to the Brain and Other Tissues of Hamsters. | 10:40 | 94. TIETJEN, WILLIAM L. AND JAMES N. LILES (Georgia Southwestern College and The University of Tennessee). Metabolic Fate of ^{14}C -Isoleucine in Non-Egg-Laying Female <i>Aedes aegypti</i> (L.). |
| 9:35 | 89. JONES, DUVALL A. (Carnegie-Mellon University). Hemolysis as a Cause of Green Tissues Among Neotropical Frogs. | 10:53 | 95. TATE, LAURENCE G. AND LARRY T. WIMER (University of South Carolina). Changes in the Carbohydrate Content During Metamorphosis of the Blowfly, <i>Phormia regina</i> . |
| | | 11:06 | 96. WIMER, LARRY T. (University of South Carolina). The Non-Glycogen Carbohydrates of the Larval Hemolymph and Fat Body of <i>Phormia regina</i> . |

ICHTHYOLOGY AND HERPETOLOGY

Basement Auditorium, Georgia Center

Presiding: Dr. Carter R. Gilbert, University of Florida

- | | | | |
|------|---|-------|---|
| 8:00 | 97. GENTRY, GLENN (Donelson, Tennessee). Notes on Collecting Amphibian Eggs for Research. | 9:25 | Recess |
| 8:20 | 98. BYRD, WILLIAM W. (Mississippi State University). Sun Compass Orientation in <i>Gastrophryne carolinensis</i> . | 9:35 | 102. ROSATO, PETER (Mississippi State University). The Potential Danger to Predators of Feeding on Pesticide-resistant Fish. |
| 8:35 | 99. SHIPP, ROBERT L. (Florida State University). A New Species of Pufferfish (genus <i>Sphoeroides</i>) from the Western Gulf of Mexico. | 9:50 | 103. PODGORNÝ, GEORGE (Winston-Salem, North Carolina). Ophidism: A Hazard of Herpetology. |
| 8:50 | 100. BLANEY, RICHARD M. (Louisiana State University). Systematics of <i>Lampropeltis getulus</i> in the Southeastern United States. | 10:10 | 104. CALDWELL, R. DALE (Alabama College). Some Interesting Records of Fishes in the Yellow Creek Drainage, Tishomingo County, Mississippi. |
| 9:10 | 101. WALL, BENJAMIN R. (University of Alabama). Studies of the Fishes of the Bear Creek Drainage of the Tennessee River System. | 10:25 | 105. PAXTON, JOHN H. (University of Georgia). The Uptake and Metabolism of Trifluralin by Goldfish, <i>Carassius auratus</i> (Linnaeus). |
| | | 10:40 | 106. DOBIE, JAMES L., ROBERT H. MOUNT, AND GEORGE FOLKERTS (Auburn University). Systematic and Phylogenetic Considerations of the <i>Graptemys</i> complex. |

FRIDAY AFTERNOON — APRIL 19

PLANT PHYSIOLOGY

SESSION 4A. Phytochemistry, General Metabolism

Room F, Georgia Center

Presiding: Dr. Frederick T. Wolf, Vanderbilt University

- | | | | |
|------|---|------|--|
| 2:00 | 107. TUCK, LINDA S. AND RAYMOND W. HOLTON (University of Tennessee). Further Studies on Water-Soluble Cytochromes from Blue-Green Algae. | 2:30 | 109. HODGES, JOHN D. AND STANLEY J. BARRAS (Southern Forest Experiment Station). Carbohydrates and Nitrogenous Compounds in the Inner Bark of Loblolly Pine: Influence of the Southern Pine Beetle and Associated Stain Fungi. |
| 2:15 | 108. HALE, M. G. (Virginia Polytechnic Institute). Loss of Organic Compounds from <i>Arachis hypogaea</i> L. Growing in Gnotobiotic Conditions. | 2:45 | 110. WARREN, CHARLES O., NORA HARVIN AND WILLIAM TURNER (Southwestern Tennessee, |

- Memphis). Lactic Acid Fermentation in *Achyla ambisexualis* (Order Saprolegniales).
 3:00 Recess
 3:15 111. ROBERTS, DONALD R. (Southeastern Forest Experiment Station). Effect of Wounding on the Composition of Slash Pine Oleoresin: A Preliminary Report.
 3:30 112. MOHAPATRA, S. C. AND H. E. PATTEE (North Carolina State University and ARS, USDA). Biochemical Changes in Immature Peanuts

- in Response to Curing Temperature.
 3:45 113. LUQUIRE, KAREN B., LINDA B. EDWARDS AND RAYMOND W. HOLTON (University of Tennessee). Studies on Respiration of Pine Pollen.
 4:00 114. JOHNS, ELIZABETH B., H. E. PATTEE AND A. E. PURCELL (North Carolina State University and ARS, USDA). Changes of Carotenoids and Lipoxidase Activity in Peanuts during Maturation and Curing.

PLANT PHYSIOLOGY

SESSION 4B. Growth and Development

Room G, Georgia Center

Presiding: Dr. Claud L. Brown, University of Georgia

- 2:00 115. POWELL, ROBERT D. AND PAGE W. MORGAN (Texas A and M University). Physiology of Hypocotyl Hook Opening.
 2:15 116. MULLINS, J. THOMAS (University of Florida). A Model for the Regulation of Hyphal Branching in the Water Molds.
 2:30 117. ROUX, STANLEY J. AND JOHN T. MCHALE (Loyola University of the South). Sequence of Ultrastructural Changes in Mesophyll Cells of Senescing Tomato (*Lycopersicon esculentum*, var. Marglobe) Leaves.
 2:45 118. RICHARDSON, B., F. W. WAGNER AND B. E. WELCH (USAF School of Aerospace Medicine). Growth of the Oxygen Tolerant Strain of *Chlorella sorokiniana* at Hyperbaric Oxygen Pressures.
 3:00 Recess
 3:15 119. OMRAN, R. G. AND ROBERT D. POWELL (Texas A and M University). Chilling Effect and Related Changes in *Hibiscus escul-*

- lentum* L. Plants.
 3:30 120. O'DELL, D. H. AND D. E. FOARD (Oak Ridge National Laboratory and East Tennessee State University). Using Colchicine to Determine the Number of Cells Initially Forming A Lateral Root Primordium.
 3:45 121. FOARD, D. E. (Oak Ridge National Laboratory). Pattern of Incorporation of Labeled Nucleic Acid Precursors in Wheat Root Pericycle.
 4:00 122. BURNS, ROBERT E. (Georgia Experiment Station). Reserve Carbohydrates and Regrowth Pattern of *Lespedeza cuneata*.
 4:15 123. AMIN, J. V. (Texas A and M University). Growth and Development of Cold-Injured Cotton Plants.
 4:30 124. CARTER, MARYETTE R. AND JOHNNY JACKSON (Atlanta University). The Effects of Ethanol on the Growth of Corn and Pea Roots.

MORPHOGENESIS AND INVERTEBRATE ZOOLOGY

Room L, Georgia Center

Presiding: Dr. J. M. Herr, Jr., University of South Carolina

- 2:00 125. JENNER, CHARLES E. AND ANNE B. MCCRARY (University of North Carolina and Wrightsville Marine Bio-Medical Laboratory). Marine Commensal Bivalve Mollusks from North Carolina.
 2:13 126. DUNDEE, DEE S. (Louisiana State University). Preliminary Survey of Introduced Molluscs of Eastern North America.
 2:26 127. HERMANN, PAT W. (University of Georgia). *Omalonyx unguis* (Gastropoda: Pulmonata: Succineidae) from Ecuador.
 2:39 128. FRIAUF, JAMES J. (Vanderbilt University). Psammolittoral Gastrotricha (Macrodasymoidea) of the Mississippi Sound Area.
 2:52 129. PAULIN, JEROME J. AND WILLIAM B. COSGROVE (University of Georgia). Ultrastructural Changes in the Life Cycle of *Crithidia fasciculata* (Zoomastigophorea, Kinetoplastida, Trypanosomatidae).
 3:05 130. HARRISON, FREDERICK W. (University of South Carolina and Presbyterian College). Epidermal Morphology of *Corvomeyenya* sp.
 3:18 131. FITZPATRICK, J. F. JR. (Mississippi State University). The Subspecies of the Crawfish *Procambarus hagenianus* (Faxon) (Decapoda; Astacidae).
 3:31 132. SPOONER, JOHN D. (Augusta College). Re-

- productive Behavior of the Fork-tailed Katydid, *Scudderia furcata*: Copulation.
 3:44 133. SPOONER, JOHN D. (Augusta College). Reproductive Behavior of the Fork-tailed Katydid, *Scudderia furcata*: Egg-laying.
 3:57 134. HERMANN, HENRY R. (University of Georgia). The Poison Apparatus of *Dasymutilla occidentalis* (Hymenoptera: Mutillidae).
 4:10 135. SINGHAS, CHARLES A. (Wake Forest University). Teratogenic Effects of Direct X-irradiation on the Otic Vesicle of the Chick Embryo.
 4:23 136. DAVIS, J. E. JR., AND NORMAN E. GARRISON (Wake Forest University). Mean Weights of Chick Embryos Correlated with the Stages of Hamburger and Hamilton.
 4:36 137. CHEEVERS, SANDRA P. AND ROY HUNTER, JR. (Atlanta University). Some *In Vitro* Effects of Potassium and Sodium Thiocyanate on the Notochord of *Rana catesbeiana* Larvae.
 4:49 138. REAMS, W. M. JR., W. H. DORMAN, AND R. E. SHERVETTE (University of Richmond). Hormones and PET Mouse Melanocytes.
 5:02 139. MCCRADY, EDWARD (University of North Carolina). *In Vitro* Culture of *Drosophila* Wing Discs.

PARASITOLOGY AND HISTOLOGY

First Floor Conference Room, Georgia Center

Presiding: Dr. Burton J. Bogitsh, Vanderbilt University

- 2:00 140. WITHERS, JOHN D. (Clark College). A Guide to the Formed Elements in Human Blood Stained with Wright's Stain.
- 2:13 141. MILLARD, WILLIAM R. AND IOLA T. MCCLURKIN (University of Mississippi). A Histological Study of the Gastric Cardiac Gland in the Beaver (*Castor canadensis*).
- 2:26 142. MARRA, MARIETTA AND GERALD WISLER ESCH (Wake Forest University). Carbohydrates in Adult and Larval *Proteocephalus ambloplitis* (Cestoda: Proteocephala: Proteocephalidae) from the Small Mouth Bass, *Micropterus dolomieu*.
- 2:39 143. ROGERS, STEFFEN H. (Vanderbilt University). Aspects of Respiration in *Schistosomatum douthitti*.
- 2:52 144. SHANNON, W. ALLEN (Vanderbilt University). Ultrastructure of the Caecum of *Schistosomatum douthitti*.
- 3:05 145. BUCKELEW, THOMAS P. AND FELIX H. LAUTER (University of South Carolina). A Study of the Glycogen Content of the Miracidial Organelles of *Diplodiscus temperatus* (Stafford, 1905).
- 3:18 146. DAVIS, DONALD A., B. J. BOGITSH, AND D. A. NUNNALLY (Vanderbilt University). Non-specific Esterase Activity in the Caecum of *Haematoloechus medioplexus*.
- 3:31 147. NUNNALLY, D. A., B. J. BOGITSH, AND D. A. DAVIS (Vanderbilt University). Nucleases of *Haematoloechus medioplexus*.
- 3:44 148. POWDERS, VERNON N. (Georgia Southwestern College). Incidence of Parasitism in Two Species of *Plethodon* (Amphibia: Plethodontidae) by *Brachycoelium* (Trematoda: Brachycoeliidae).
- 3:57 149. KRISSINGER, WAYNE A. AND KRISHNA N. MEHRA (Georgia Southern College). Studies on the Biology of *Proterometra albicauda*, Anderson and Anderson, 1967, an Azygiid Trematode.
- 4:10 150. WHICKER, MARTHA H. AND FELIX H. LAUTER (University of South Carolina). A Preliminary Report on Gametogenesis and Fertilization in the Heterogonic Life Cycle of *Rhabdias ranae* Walton, 1929.
- 4:23 151. HOBBS, H. H. III (Mississippi State University). The Possibility of Host Specificity in the Genus *Ornithocythere* (Ostracoda, Entocytheridae).
- 4:36 152. STEPHENS, RALPH E., MADISON B. COLE, JR., ADA A. COLE, AND J. GORDON CARLSON (The University of Tennessee). Parasitization of *Chortophaga viridifasciata* Eggs by Larvae of *Scelio bisulcus*.
- 4:49 153. COLLINS, RICHARD F. (Wake Forest University). Helminths of *Natrix* spp. and *Agkistrodon piscivorus* in Eastern North Carolina (Reptilia: Ophidia).
- 5:02 154. BECKERDITE, FRED W., GROVER C. MILLER, AND REINARD HARKEMA (North Carolina State University at Raleigh). A Review of the Genus *Pharyngostomoides* (Trematoda: Diplostomatidae).
- 5:15 155. PRICE, CHARLES E. (Augusta College). The Death of Classical Parasitology?

GENETICS, CYTOLOGY, AND PLANT MORPHOLOGY

Room A, Georgia Center

Presiding: Dr. Charles Ray, Jr., Emory University

- 2:00 156. VARMA, BASUDEO (Georgia Southern College). Interaction between Virus and Susceptibility Gene for Tumor Development in Mice.
- 2:13 157. BATH, DANIEL W. (University of Mississippi). Linkage Studies on X-ray Induced Semisterility in the Mouse.
- 2:26 158. BIGGERS, CHARLES J. (University of South Carolina). Serum Protein Polymorphisms in *Peromyscus polionotus*.
- 2:39 159. FETNER, R. H. AND M. V. ZEHR (Georgia Institute of Technology). Chromosome Aberrations in the Cells of Chinese Hamster (*Cricetulus griseus*) Embryos after Paternal X-radiation.
- 2:52 160. COLE, MADISON B., JR., ADA A. COLE, AND J. GORDON CARLSON (University of Tennessee). Action of Puromycin Dihydrochloride on Protein Synthesis and Mitosis.
- 3:05 161. RISINGER, LARRY D. AND FELIX H. LAUTER (University of South Carolina). A Morphological and Cytochemical Study of *Hexamitus batrachorum* Swezy, 1915.
- 3:18 162. ALDRICH, HENRY C. (University of Florida). Ultrastructure of Mitosis in Plasmodia and Myxamoebae of *Physarum flavicomum*.
- 3:31 163. CALHOUN, FORD AND H. BRANCH HOWE, JR. (University of Georgia). Nuclear Movement During Development of Four-Spored and Eight-Spored Asci in *Neurospora tetrasperma*.
- 3:44 164. BALLAL, S. K. AND NICHOLAS P. FARRELL (Tennessee Technological University). The Effectiveness of Phenanthrene as a Radiomimetic Agent.
- 3:57 165. BEATTY, A. V. AND H. L. DAVIS (Emory University). Electron Microscopic Studies on the Periplasmodium of *Tradescantia*.
- 4:10 166. DAVIS, H. L. AND A. V. BEATTY (Emory University). The Ultrastructure of Irradiated Microspores.
- 4:23 167. TAYLOR, FRED G., JR. (Oak Ridge National Laboratory). Tissue Anomalies in Tree Species Following Fast Neutron or Gamma Irradiation.
- 4:36 168. YEATS, FRED T. (University of Mississippi and University of South Carolina). Development of the Gametophyte of *Woodwardia areolata* in Sterile Culture: The Effects of Exogenous Sucrose.
- 4:49 169. HERR, J. M., JR. AND DAVID H. REMBERT, JR. (University of South Carolina). Some Effects of Low Temperature Treatment on Sporocarp Germination and Gametophyte Development in *Marsilea* L.
- 5:02 170. REMBERT, DAVID H., JR. (University of South Carolina). Megaspore Tetrad Patterns in Leguminosae.
- 5:15 171. ANDERSON, C. E. AND R. W. SEIBERT (North Carolina State University). Seedling Development in *Juncus roemerianus*.

ECOLOGY

Room K, Georgia Center

Presiding: Dr. Dirk Frankenberg, University of Georgia

- | | | | | | |
|------|------|---|------|------|---|
| 2:00 | 172. | TENORE, KENNETH R. (North Carolina State University). Effect of Bottom Substrates on the bivalve, <i>Rangia cuneata</i> . | | | SMITH (University of Georgia). The Effect of Temperature and Radiation on Litter Size in <i>Peromyscus polionotus</i> . |
| 2:13 | 173. | BURBANCK, W. D. AND B. J. M. KELLEY, JR. (Emory University). Effects of Salinity and Acute Gamma Irradiation on the Osmoregulation of Juvenile and Adult Anthurid Isopods, <i>Cyathura polita</i> . | 3:44 | 180. | WAGNER, C. KENYON (University of Georgia). Environmental Control of Oxygen Consumption in Cotton Rats. |
| 2:26 | 174. | MENZEL, R. W. (Florida State University). The Species and the Distribution of Quohog Clams (<i>Mercenaria</i>). | 3:57 | 181. | MOORE, CLIFTON H., RONALD BLESSING, AND MICHAEL H. SMITH (Savannah River Ecology Laboratory). Variation of Pelage Color in Species of Mice. |
| 2:39 | 175. | MCCASKILL, VON H. AND RUDOLPH PRINS (Clemson University). Stoneflies (Plecoptera) of Northwestern South Carolina. | 4:10 | 182. | JACKSON, CRAWFORD G., JR. (Mississippi State College for Women). A Study of Allometric Growth in <i>Pseudemys concinna suwanniensis</i> Carr (Order: Testudinata). |
| 2:52 | 176. | GITTLESON, STEPHEN M. (University of Kentucky). Specific Gravities of Microorganisms. | 4:23 | 183. | MAHONEY, JOSEPH J., JR. (University of Georgia). Photoperiod Acclimation of High Temperature Tolerance in Tropical and Temperate Frogs. |
| 3:05 | 177. | WHITING, P. W. (Oak Ridge National Laboratory). How Long Will Diapause Larvae of <i>Mormoniella</i> Live? | 4:36 | 184. | HARVEY, MICHAEL J., JAMES W. HARDIN, AND ROGER W. BARBOUR (Memphis State University and University of Kentucky). Movements of the Eastern Worm Snake, <i>Carphophis amoenus amoenus</i> . |
| 3:18 | 178. | WILLIAMS, ROGER G., MICHAEL H. SMITH, AND JAMES L. CARMON (University of Georgia). Influence of Temperature Upon the Susceptibility to Acute Irradiation in <i>Peromyscus polionotus</i> . | 4:49 | 185. | MCCAULEY, ROBERT W. (Waterloo Lutheran University). Upper Lethal Temperatures and the Distribution of Fresh Water Fish. |
| 3:31 | 179. | WELLS, J. R., J. L. CARMON, AND M. H. | | | |

PLANT ECOLOGY

Auditorium, Georgia Center

Presiding: Dr. A. W. Cooper, North Carolina State University

- | | | | | | |
|------|------|--|------|------|--|
| 2:00 | 186. | WITHERSPOON, J. P. (Oak Ridge National Laboratory). Genetic Factors Relating to Radiosensitivity of <i>Populus deltoides</i> . | | | ture Stand of <i>Pinus taeda</i> of the Congaree Swamp. |
| 2:13 | 187. | DAYTON, BRUCE R. (University of North Carolina and Savannah River Ecology Laboratory). Cycling of Radiostrontium by Loblolly Pines (<i>Pinus taeda</i> L.). | 3:44 | 194. | BATSON, WADE T. (University of South Carolina). Preliminary Report of a Botanical Survey at Georgetown, South Carolina. |
| 2:26 | 188. | MILLER, GARY L. (University of North Carolina). The Influence of Season on the Radiation Sensitivity of an Old Field Community. | 3:57 | 195. | WARE, STEWART A. (College of William and Mary). Southern Mixed Hardwood Forest in the Virginia Coastal Plain. |
| 2:39 | 189. | EDMISTEN, JOE A., REX CRAIG, MIKE HARRELSON, AND JANE WATTS (University of Georgia). Leaf Epiphytes and Nitrogen Fixation. | 4:10 | 196. | BURK, C. JOHN (Smith College). Phyto-geography of Three Sections of the Massachusetts Coast. |
| 2:52 | 190. | DUEVER, MICHAEL J. (University of Georgia). A Structural Description of Second Growth Vegetation in Eastern Panama. | 4:23 | 197. | ALEXANDER, TAYLOR R. (University of Miami). Effects of Hurricane Betsy (September '65) on the Florida Southeastern Saline Everglades — A Two Year Study. |
| 3:05 | 191. | CHILD, GEORGE I. (University of Georgia). Four Tropical Forests of Eastern Panama; a Structural Comparison. | 4:36 | 198. | PLUMMER, G. L. (University of Georgia). Remote Sensing for Plant Ecological Studies on a Watershed in Georgia. |
| 3:18 | 192. | WHIGHAM, DENNIS (University of North Carolina). Vegetational Patterns Along an Altitudinal Gradient — Community or Continuum? | 4:49 | 199. | RIVERS, ROBERT H. AND G. L. PLUMMER (University of Georgia). Moisture Depletion Within Crop-Soil Sites. |
| 3:31 | 193. | STALTER, RICHARD (University of South Carolina). An Ecological Study of a Ma- | 5:02 | 200. | STUBBLEFIELD, SAMUEL M., JR. (Tennessee Technological University). Correlations between Soil Moisture and Vegetational Types of an Island. |
| | | | 5:15 | 201. | ROGERS, HOLLIS J. (University of North Carolina). Conservation of Plant Species. |

ICHTHYOLOGY AND HERPETOLOGY

Basement Auditorium, Georgia Center

Presiding: Dr. Denzel E. Ferguson, Mississippi State University

- 2:00 202. WILLIAMS, JAMES D. AND HERBERT T. BOSCHUNG (University of Alabama). Distribution and Variation of the Flame Chub, *Hemimtrania flammea* (Jordan and Gilbert).
- 2:15 203. WARD, JAMES W. (University of Mississippi Medical Center). Hematological Studies on the Australian Lungfish, *Neoceratodus forsteri* Krefft.
- 2:30 204. SEAMAN, WILLIAM (University of Florida). Distribution and Variation of the American Cyprinid Fish *Notropis hudsonius* (Clinton).
- 2:45 205. SMITH, GARY C. (University of Georgia). Territorial Behavior of the Dwarf Cichlid, *Apistogramma ramirezi*.
- 3:05 206. HASTINGS, ROBERT W. (Florida State University). Ecology and Life History of the Diamond Killifish, *Adinia xenica* (Jordan and Gilbert).
- 3:20 Recess
- 3:30 207. GIBSON, JAMES R. (Mississippi State University). Sources of Error in the Fish-brain Acetyl Cholinesterase Activity as a Monitor for Pollution.
- 3:45 208. GILBERT, CARTER R. (University of Florida). A Mass Shoreward Movement of Demersal Fishes on the East Coast of Florida in September, 1962.
- 4:00 209. WOOLCOTT, WILLIAM S. (University of Richmond). Hybridization Between the Percid Fishes *Percina notogramma* (Raney and Hubbs) and *Percina peltata* (Stauffer) in Virginia.
- 4:15 210. SWIFT, CAMM C. (Florida State University). Variation and Distribution of the American Cyprinid Fishes *Notropis texanus* and *Notropis chalybaeus*.
- 4:30 211. LUDKE, JAMES LARRY AND CHARM MCINGBALE (Mississippi State University). Oxygen Consumption in Susceptible and Endrin-resistant *Gambusia* During Sublethal and Acute Endrin Exposure.
- 4:40 212. RELYEA, KENNETH (Jacksonville University). Comments on the Distribution and Systematics of Southeastern Killifishes (family Cyprinodontidae).
- 5:00 213. BERRY, FREDERICK H. (Tropical Atlantic Biological Laboratory). BCF Field Guides to Western Atlantic Fishes: Carangidae.

Conference on Distributional History of Invertebrate Biota of Southern Appalachians to be Sponsored by Virginia Polytechnic Institute and ASB

A conference on the distributional history of the invertebrate biota of the Southern Appalachians will be held at Virginia Polytechnic Institute from June 27 to 29, 1968. The conference will be sponsored by Virginia Polytechnic Institute and the Association of Southeastern Biologists — and is being arranged by Dr. Perry C. Holt and Dr. Harrison R. Steeves, III, both of Virginia Polytechnic Institute.

Participants in the conference will address themselves to such questions as: a) Evidence that the Southern Appalachians have been an important center of speciation and evolution, b) The geological antiquity of the area and its effects on the evolution of organisms, c) The parts played by geographical barriers and ecological changes on organisms, d) Geographical relations between the Southern Appalachians and other areas of the world, and e) Evidences that the region has been an important refugium during past climatic changes.

The program, based on five formal sessions and an evening informal discussion, will consist

of thirteen invited papers — and additional systematists with known interests in the area will be invited to attend and participate in the discussions. Invited participants in the symposium include the following: Dr. Thomas C. Barr, University of Kentucky, carabid beetles; Dr. John Burch, University of Michigan, land snails; Dr. George Byers, University of Kansas, mecoptera; Dr. Joseph F. Fitzpatrick, Jr., Mississippi State University, crayfishes; Dr. John T. Hack, U. S. Geological Survey, geology; Mr. C. W. Hart, Jr., Academy of Natural Sciences of Philadelphia, entocytherid ostracods; Dr. Horton H. Hobbs, Jr., U. S. National Museum, crayfishes; Dr. Richard L. Hoffman, Radford College, millipedes; Dr. John Holsinger, East Tennessee State University, amphipods; Dr. Perry C. Holt, Virginia Polytechnic Institute, branchiobdellid worms; Dr. William R. Murchie, University of Michigan, earthworms; Dr. Robert D. Ross, Virginia Polytechnic Institute, geology; and Dr. Harrison R. Steeves, III, Virginia Polytechnic Institute, isopods.

Abstracts of Papers Presented at the 29th Annual Meeting of the Association of Southeastern Biologists

The number in parenthesis at the top of each abstract refers to the number of that paper in the program.

(162)

Ultrastructure of Mitosis in Plasmodia and Myxamoebae of *Physarum flavicomum*

HENRY C. ALDRICH, *University of Florida*

Mitotic divisions in the plasmodial or diploid stage of *Physarum flavicomum* are of a strikingly different type than those in the myxamoebae or haploid stages. Plasmodial mitosis is characterized by an intranuclear spindle and the absence of centrioles and asters at the poles, much as in protozoa. In contrast, mitosis in the myxamoeba is characterized by breakdown of the nuclear envelope at prometaphase and the presence of centrioles and asters at the poles, details of the process being similar to mitosis in animal cells. Possible applications of this observation in determining ploidy of a given stage in the life cycle, as well as the phylogenetic aspects, will also be discussed.

(197)

Effects of Hurricane Betsy (September '65) on the Florida Southeastern Saline Everglades — A Two Year Study

TAYLOR R. ALEXANDER, *University of Miami*

Salt water flooding and impoundment caused a salinity level in soil-water approaching sea water in concentration that selectively affected plants over a large area. Damage was severe even on some salt-tolerant species. Tree islands and the surrounding marl prairies were affected to different degrees by the salt water. Plant kill for some species such as sawgrass was as high as ninety six percent in the marl soils. Most of the West Indian broad-leaved plants failed to survive in the tree islands. Monthly chloride and electrical conductivity measurement of soils showed that the area returned to normal salinity values within one to two months after the storm. Measurements of plant recovery indicate a slow rate. There are areas in which one plant species has been replaced by another. The most spectacular is the replacement of sawgrass (*Cladium jamaicense* Crantz) by spike-rush (*Eleocharis cellulosa* Torr) in the marl prairie.

(123)

Growth and Development of Cold Injured Cotton Plants

J. V. AMIN, *Texas A & M University*

The results of a study of growth and development of cold injured cotton plants indicate that the extent of cold injury in cotton plants may be determined by an interaction of plant physiological malfunction and environmental stress. The climate immediately after the cold exposure appears to influence the recovery of the plants. Expression of chill damage may be increased if the low temperature period is followed immediately by bright sunny days, however if the low temperature period is followed by cloudy weather damage may be decreased. Also, night temperatures below 15°C may retard the recovery of damaged cotton.

The effects of vitamins and IAA on the recovery of the plants suggested that the chilled cotton plants de-

velop temporary metabolic lesions during their recovery. These results also indicate that it may be possible to use chemicals to overcome the effects of low night temperatures and to establish rapid recovery in chilled injured cotton plants.

(171)

Seedling Development in *Juncus roemerianus*

C. E. ANDERSON AND R. W. SEIBERT,
North Carolina State University

Seeds of *Juncus roemerianus* have been germinated in the laboratory. Although *Juncus roemerianus* is primarily a brackish water species, the seeds germinate readily in distilled water while various salt concentrations tend to inhibit germination. The seed itself seems to contain a simple fleshy cotyledon. Germination proceeds at the micropylar end with elongation of the cotyledon-petiole. Roots are initiated at the base of the cotyledon-petiole, and a plumule is formed inside it. The plumule protrudes through the side of the petiole and emerges as the primary leaf.

(164)

The Effectiveness of Phenanthrene as a Radiomimetic Agent

S. K. BALLAL AND NICHOLAS P. FARRELL,
Tennessee Technological University

It has been known for a long time that certain chemicals have radiomimetic and carcinogenic properties. Phenanthrene belongs to the family of suspected carcinogens, and the male sex hormones are the cyclopentaphenanthrene derivatives. For this reason phenanthrene was chosen to study its possible effectiveness as a radiomimetic agent. Root meristems of onion, rye grass, and clover were treated with 50% phenanthrene in well-ground alumina for 24 hours, after which the root tips were fixed in 3:1 Carnoy's for 24 hours. The tissue was hydrolysed in 6N HCl and stained with Feulgen's for one hour, and examined. There was no significant aberrated figures noticed in clover and onion root tips. However, in the case of rye grass, the number of cell divisions had increased considerably over the controls, and a slight radiomimetic effect was evident as measured by the induction of aberrations in the chromosomes, the single and double bridges being more common than the single and double dot deletions.

(76)

Iron Neuston Communities

STUART S. BAMFORTH, *Tulane University*

Shallow standing waters of high organic content often support associations of iron filamentous bacteria and/or *Anthophysa* at the surface. The sheaths and stalks of these organisms provide an elaborate branching substrate for non-filamentous bacteria, and with the numerous spaces, a mixing place for swimming, gliding, and interface protists. The latter represent all taxons, exhibit all body types, and occur at all trophic levels. Such associations provide excellent examples for the study of diversity indices. Iron organisms are "gradient organisms"

from the standpoint of pH-Eh considerations, and the occurrence of these associations in waters of widely different ionic concentrations presents interesting problems in the ecology of free-living protists.

(31)

Water-Use Efficiency during Cyclic Variation in Gas Exchange in Cotton and Pepper

HENRY D. BARRS, *Duke University and C.S.I.R.O., Australia*

Water-use efficiency, measured as the ratio of photosynthesis to transpiration, was followed during induced cyclic variation in gas exchange in a controlled environment. The variations in photosynthesis and transpiration were in phase, and water-use efficiency remained constant over a wide range of gas exchange rates, even though considerable water stress developed at peak exchange rates. Water-use efficiency similarly remained constant as gas exchange rates declined following the excision of a sunflower leaf which was not showing cyclic behaviour.

These results are consistent with the view that mesophyll resistance to inward diffusion of CO_2 is unimportant in these species. They also suggest that foliar application of chemical antitranspirants is unlikely to increase water-use efficiency.

(30)

Causes of Cyclic Changes in Transpiration in Pepper, Sunflower and Cotton Plants

HENRY D. BARRS AND BETTY KLEPPER,
Duke University and C.S.I.R.O., Australia

Using plants grown in culture solution and transferred to a controlled environment, cyclic changes in stomatal aperture, transpiration, and leaf water potential were measured. Such changes could occur spontaneously in cotton, although they were usually induced by illumination following a 20 minute dark period. For cycling to occur in pepper and sunflower, additional treatment of the roots was necessary.

The roots are identified as the site of the major resistance to water flow through the plant. Root resistance varied diurnally, increasing at night. This resistance was considered to be the first link in the chain of events leading to cycling. Hydropassive stomatal movements facilitated cycling in pepper and cotton, but were apparently absent in sunflower. Plant resistances may indirectly be of importance in the movement of water from the plant to the air.

(60)

Germination of Twelve Species from the Middle Tennessee Cedar Glades

JERRY M. BASKIN, *University of Florida* AND
CAROL CAUDLE, *Vanderbilt University*

Requirements for the germination of 12 species from the cedar glades of Middle Tennessee were investigated. Treatments which induced high germination percentages included stratification, after-ripening in dry storage, low temperature, and imbibition in solutions of gibberellic acid and thiourea. The germination requirements of these 12 species will be discussed in relation to germination and seedling establishment in nature.

(157)

Linkage Studies on X-Ray Induced Semisterility in the Mouse

DANIEL W. BATH, *University of Mississippi*

Thirty-eight semisterile lines have been established from the progeny of irradiated male mice (640r or 700r of X-rays) with markers in six linkage groups. Semisterility is inherited in each of the lines and appears due to reciprocal translocations. This has been cytologically verified in some lines. Genetic analysis for association of markers has been carried out on all lines. Five lines show linkage between two of the markers employed. Of these, three show association of linkage groups I and VIII. Chi square values for independence are 25.7 ± 2.5 , 11.8 ± 1.5 , and 15.0 ± 1.9 , with indicated recombination frequencies of 15.7 ± 5.1 , 21.9 ± 7.3 , and 23.3 ± 6.4 per cent. Two lines show associations between linkage groups III and XIV (Chi square for independence, 12.6 ± 1.9 ; indicated recombination frequency 24 ± 8.5 per cent) and between VIII and XIV (Chi square for independence, 14.9 ± 1.9 ; indicated recombination frequency, 29.1 ± 4.9 per cent). The line involving VIII and XIV is known cytologically to have a reciprocal translocation.

(194)

Preliminary Report of a Botanical Survey at Georgetown, South Carolina

WADE T. BATSON, *University of South Carolina*

An inventory of the green plants and a study of certain related ecological considerations on the Belle W. Baruch Foundation plantation at Georgetown, South Carolina, were initiated during the summer of 1967. To date, the accomplishment of three objectives has been undertaken. They are: 1) a qualitative and seasonal distribution study of the fresh water algae, 2) a floristic analysis of the vascular flora with relation to soil type, and 3) an ecological study focused on the salt marshes with an effort to recognize and describe the physical features, map the vegetation zones, find the factors influencing the distribution of the plants occurring there, and to study productivity.

(165)

Electron Microscopic Studies on the Periplasmodium of *Tradescantia*

A. V. BEATTY AND H. L. DAVIS, *Emory University, Atlanta, Ga.*

Developing microspores between meiosis and the first microspore division in the anthers of *Tradescantia paludosa* have been studied. The material was fixed either in 5% potassium permanganate for two minutes at room temperature or in glutaraldehyde-osmium tetroxide series in an ice bath. The material was embedded either in methacrylate or epon-araldite mixtures. Some of the organelles in the periplasmodium which was formed by the breakdown of the cell walls of the tapetal cells seem to be in an active state. A comparison will be made between these organelles and those found inside of the developing microspore.

(154)

A Review of the Genus *Pharyngostomoides* (Trematoda: Diplostomatidae)

FRED W. BECKERDITE, GROVER C. MILLER, AND
REINARD HARKEMA, *North Carolina State University*
at Raleigh

An investigation was undertaken to determine whether two morphological forms presently designated as *Pharyngostomoides procyonis* Harkema, 1942, are actually two species. The morphology of the larval and the adult forms is described. The development of the fluke from the egg to the production of cercariae is described.

Due to the differences in morphology of both the cercariae and the adults, it is concluded that there are two species. *Pharyngostomoides procyonis* is redescribed to include only one form. *Pharyngostomoides ovalis* Chandler and Rausch, 1946, is reinstated as the second species.

(18)

Non-Induced Cellulolytic Enzymes of *Diplodia zeae* (Schw.) Lev.

J. N. BEMILLER, D. O. TEGTMEIER, AND A. J. PAPPELIS,
Southern Illinois University

The cellulolytic enzymes of *Diplodia zeae* appear to be constitutive. Cellulolytic activity is found even in high concentrations of D-glucose, with or without cellulose in the medium. This activity occurs on the surface of the fungal hyphae and is released to the culture medium only when most of the available carbohydrate is used up. It is suggested that enzyme release plays an important role in measurements of enzyme production and control of enzyme synthesis. Cellulolytic enzymes are released from the hyphal surface by polygalacturonate, lignosulfonate, and 2-mercaptoethanol, suggesting that it is bound in part by electrostatic forces. These same compounds release cellulolytic activity adsorbed on cellulose particles.

(17)

Effects of Ethylene on Auxin Transport and Abscission

ELMO BEYER, JR. AND PAGE W. MORGAN,
Texas A & M University

The ability of ethylene to inhibit basipetal auxin transport is directly related to the length of the ethylene fumigation period. Previously, we reported such a time sequence effect of ethylene on auxin transport. Extended studies of this phenomenon using refined techniques demonstrate that ethylene significantly reduces auxin transport in cotton stem sections after plants are fumigated for only 3 hours. The magnitude of this reduction in transport, as well as an increase in the rate of IAA-1-¹⁴C decarboxylation, parallels the length of the ethylene fumigation period. Preliminary studies also indicate an ethylene mediated reduction in transport velocity. The significance of changes in decarboxylation and transport velocity are discussed with regard to the phenomenon of ethylene mediated transport reduction.

Results of abscission tests of intact cotton plants fumigated with ethylene show that the change in auxin transport precedes by several hours ethylene induced abscission. This observation strengthens the previous suggestion (Morgan and Gausman, *Plant Physiol.* 41:45, 1966) that exogenous ethylene accelerates abscission, at least in part, through its effect on auxin transport.

(158)

Serum Protein Polymorphisms in *Peromyscus polionotus*

CHARLES J. BIGGERS, *University of South Carolina*

Serum protein polymorphisms were investigated in 180 oldfield mice, *Peromyscus polionotus*, collected from three major localities along an eighty mile transect in South Carolina. Transferrins, albumins and other proteins were separated by polyacrylimide gel electrophoresis. Transferrin activity was confirmed by the Ornstein procedure. Six transferrin variants consisted of three single band and three double band phenotypes. Two of the six transferrin variants occurred at the northeastern-most collection site, whereas all six variants were found at the southernmost locality. Albumin variants appeared both in mice collected from the wild and within a laboratory colony of *P. polionotus* established from mice collected in Aiken County, S. C. Two variants of pre-albumin and three post-albumin variants also appeared. Geographical distribution of these variants is of interest in the evolutionary development of this species.

(46)

Ultrastructure of *Pilimelia anulata* (Actinoplanaceae)

CHARLES E. BLAND, *University of North Carolina*

The ultrastructural features of the hyphae and sporangia of a keratinophilic member of the Actinoplanaceae, *Pilimelia anulata*, were studied with electron microscopy. Colonies growing on hair were found to be composed of two hyphal types; substrate or vegetative hyphae, and palisade or sporangium forming hyphae. The substrate hyphae, which branched throughout the inner matrix of the hair, contained numerous intracytoplasmic membranous bodies which were often closely appressed to the finely fibrillar nuclear material.

The sporangia, which appeared to be formed by a process similar to that described by Lechevalier, Lechevalier, and Holbert (1966) for other members of the Actinoplanaceae, contained parallel rows of cylindrical spores that originated from a source at the base of the sporangia. A single membranous body was observed in almost every spore sectioned. The membranous bodies of the spores appeared to arise from the plasma membrane and then to become closely associated with the nuclear region. Possible functions of the membranous bodies of *P. anulata* were considered in the light of functions proposed by other investigators for similar structures in *Streptomyces* sp. and other bacteria.

(79)

Supplementary Food and Population Dynamics of the Old-Field Mouse

RONALD W. BLESSING AND MICHAEL H. SMITH,
Savannah River Ecology Laboratory

Supplementary food, 50 pounds of wild bird seed every ten days, was added to one half of a 9 acre field. The population was censused by live trapping and burrow counts at periodic intervals. Mice on the treated half (food added) built more burrows, showed a higher reproductive rate, less movement between successive captures, an increased density during the winter but not during the summer, and approximately the same average body weight as the mice on the untreated half of the field. At the end of the first year, we doubled the amount of food added per unit time per unit area. Similar trends are apparent in the data for the first half of

the second year. Thus, food appears to be important as a limiting factor in the population dynamics of the old-field mouse, *Peromyscus polionotus*, in South Carolina.

(8)

Effects of Ca and Sr on Maize Seedling Primary Roots

ELDON BONDS, *Tennessee Wesleyan College* AND
JOSEPH C. O'KELLEY, *University of Alabama*

Either Ca or Sr in a mineral nutrient medium prevented toxic effects of other nutrient ions on aerated primary roots of maize; other monovalent and divalent cations substituted for these did not. Calcium in the complete nutrient solution, or as CaCl_2 alone, stimulated the division of apical meristem cells in these roots, but Sr did not. However, the replacement of Ca in the nutrient medium by Sr resulted in the development of additional secondary roots, probably by decreasing the rate of cell division in the apical meristem of the primary root and diminishing apical dominance.

(53)

The Use of Glass Micro-beads in the Study of Soil Fungi

P. E. BOSTICK, *Emory University*

One of the characteristics of soil that is usually neglected in field and laboratory studies of soil microbiology is its particulate nature. A method is described whereby fungi may be cultivated hydroponically in containers filled with glass micro-beads saturated with a nutrient solution. Four bead sizes are commercially available and these correspond to three of Wentworth's particle size classes: 1-1.05 mm dia. ("very coarse sand"), 0.45-0.50 and 0.25-0.30 mm dia. ("medium sand"), and 0.17-0.18 mm dia. ("fine sand"). Czapek-Dox liquid medium at pH 7.2 seems to be satisfactory for the growth of most fungi in these systems. Growth may be measured as millimeters of gas evolved, weight loss from the entire system, and by dry weight of the mycelium. An example of correlation of field observations with laboratory micro-bead experiments will be presented.

(43)

Correlation of Environmental Factors and Known Distribution of *Taxus canadensis* Marsh, in Kentucky

EDWARD T. BROWNE, JR., *Memphis State University*

Until 1967 *Taxus canadensis* in Kentucky was known from only two locations in one county. Last year a second county record was reported, and it has since been discovered in a third. In all known localities this species has been determined to grow in soils derived from limestone, and all localities thus far reported are situated along rivers or creeks at points where these cross either the Pottsville or Waverly escarpment. Exposure does not seem to be a factor involved since stations occur on north, west and south slopes. However, climatological data may help to explain the disjunct distribution of this species since correlations may be observed between January and July mean maximum and minimum temperatures and other factors. These factors would seem to indicate that *T. canadensis* probably occurs over a much wider range than has been heretofore suspected.

(145)

A Study of the Glycogen Content of the Miracidial Organelles of *Diplodiscus temperatus* (Stafford, 1905)

THOMAS P. BUCKELEW AND FELIX H. LAUTER,
University of South Carolina

The miracidia of *Diplodiscus temperatus* (Stafford, 1905) were stained by the Bauer-Feulgen Method specific for glycogen. Two variables were presented in the study. First, the miracidia were allowed to swim in filtered pond water for specific intervals of time. After swimming for varying lengths of time, the miracidia were stained by the Bauer-Feulgen Method. Secondly, the filtered pond water in which the miracidia were swimming was aerated to determine the effect of aeration on the utilization of glycogen. A control was effected in the use of 5% diastase to hydrolyze the glycogen. The purpose was to determine in which organ or organelle the glycogen was located, how fast it was depleted, and to what extent it was present. From these premises, it was concluded that the glycogen content diminished as the miracidia approached terminal time. The aeration of the filtered pond water decreased the utilization of glycogen and the length of terminal time. These results provided a number of postulations.

(173)

Effects of Salinity and Acute Gamma Irradiation on the Osmoregulation of Juvenile and Adult Anthurid Isopods, *Cyathura polita*

W. D. BURBANCK AND B. J. M. KELLEY, JR.,
Emory University

The ability to osmoregulate was determined by cryoscopic measurement of the depression of freezing points of the body fluid of juvenile and adult cyathurans which received a dose of about 44,000 r from the Cs 137 source at Emory University and were subjected to salinities of from 0 to 40 o/oo. Laboratory experiments were performed on animals obtained from St. John's River at Green Cove Springs, Florida (0.5 o/oo salinity). At low salinities (experimental period of 3 hours) adults and juveniles were equally able to regulate, but at 40 o/oo (NaCl), adult *C. polita* were better able to osmoregulate than juveniles whether irradiated or non-irradiated, and non-irradiated animals regulated better than irradiated ones. Pilot studies of non-irradiated adult and juvenile cyathurans exposed to sea water dilutions for 24 and 48 hours again showed reduced ability of juveniles to regulate at higher salinities. This differential ability may cause a high mortality of juveniles in nature and in part account for the disjunct estuarine distribution of *C. polita*. (Work supported by NSF Grant GB-3122, AEC Grant AT-(40-1)-2412, and McCandless Fund, Emory University.)

(196)

Phytogeography of Three Sections of the Massachusetts Coast

C. JOHN BURK, *Smith College*

Tundra vegetation probably existed on Nantucket Island when Outer Cape Cod and the Elizabeth Islands were under the ice of the last glaciation. These three sections were part of a common land mass of glacial deposits lying over an ancient coastal plain in eastern Massachusetts which were separated by the rising sea level not more than 5000 years ago at a time when the climate was as warm as the present or warmer. At pres-

ent a greater number of native vascular plant species occurs in all three sections than would be predicted if the floras of the sections were composed of species randomly distributed from a common source; any two sections (Nantucket-Outer Cape, Elizabeth Islands-Outer Cape, Nantucket-Elizabeth Islands) share nearly the number of species predicted on this basis; and the number of independently-held species for each section is greater than predicted. The phytogeography will be discussed in relation to these factors.

(122)

Reserve Carbohydrates and Regrowth Pattern of *Lespedeza cuneata*

ROBERT E. BURNS, *Georgia Experiment Station*

The persistence of *Sericea* (*Lespedeza cuneata* cum de cours G. Don) is affected by cutting late in the season prior to senescence. In this study, roots were collected at the time of clipping for hay between mid-July and early September and again in January from similarly treated plants. The reserves in the roots collected at time of harvest were larger in those clipped after mid-August. The reserves in the January samples declined abruptly in those plants clipped after mid-August. Regrowth of plants clipped before mid-August was from stem buds, and after mid-August from root buds. This latter growth pattern apparently depleted the root reserve and caused decrease in stands in subsequent years.

(90)

Experimental Demonstration of Lymphatic Blockage

ROBERT G. BURSEY AND WILBUR A. WELLBAND, *Medical College of Georgia*

Dilatation of retrosternal lymphatic channels in rats has been observed radiographically following the intraperitoneal injection of a fine suspension of barium sulfate (Micropaque). The functional status of these vessels is unclear and is the subject of the present paper. Varying concentrations of Micropaque were injected intraperitoneally in 65 rats, while 55 controls received Ringer-Locke solution. After 30 days all rats were given intraperitoneal injections of protein bound Evans blue dye, intradermal injections of formalin, and ear crush. The animals were sacrificed 4, 5, 7, and 10 hours later. A blood sample was obtained and the degree of lymph vessel coloration and dye extravasation in the skin lesions noted.

Dye extravasation at injury sites appeared later in experimental rats and seldom attained the intensity of controls. The degree of lymph vessel coloration and plasma dye concentration in the Micropaque treated animals was significantly less than the control rats. Thorax x-rays confirmed dilatation of the retrosternal and diaphragmatic lymphatics in experimental rats. It was concluded that intraperitoneal injections of Micropaque produced a partial block in the lymphatics draining the peritoneal cavity.

(163)

Nuclear Movement During Development of Four-Spored and Eight-Spored Asci in *Neurospora tetrasperma*

FORD CALHOUN AND H. BRANCH HOWE, JR., *University of Georgia*

Serial dissections of approximately 100 wild type, four-spored asci with homokaryotic ascospores showed that the m/m, m/m, +/+, +/+, allelic pattern oc-

curred exclusively. The four-spored ascus is therefore linearly ordered, and the occurrence of nuclear passing is indicated at both the second and third divisions during ascus development. This species produces eight-spored asci, and a smaller proportion of four-spored asci, in crosses which are heterozygous for the *E* locus. Serial dissections of 273 eight-spored asci from such crosses, which were also segregating for several other markers, showed that about half of the asci were linearly ordered, in that members of each of the four spore-pairs were identical; with respect to a centromere marker, all three allelic arrangements (4:4, 2:2:2:2, and 2:4:2) were found. The remainder of the eight-spored asci analyzed showed varying degrees of disorder, in that members of one or more spore-pairs were non identical. Certain second divisional nuclear movements are postulated as the cause of the ordered and disordered ascospore patterns observed. About 100 four-spored asci from these same heterozygous *E* crosses showed the same single allelic pattern that had been found in the wild type, four-spored asci in which *E* was not present.

(124)

The Effects of Ethanol on the Growth of Corn and Pea Roots

MARYETTE R. CARTER AND JOHNNY JACKSON, *Atlanta University*

Corn grains (*Zea mays* L. var. Hasting's Prolific) and pea seeds (*Pisum sativum*, var. Alaska) were cultured in the dark for 3 days in distilled water or in various dilute solutions of ethyl alcohol (0.0001-4.0%). The results showed that root elongation and root dry weight were increased significantly in both kinds of plants by the more dilute concentrations of alcohol (0.0001 and 0.001%). However, at higher levels (2.0 and 4.0%) severe retardation of root growth was apparent. Insofar as the enhancement of total root elongation and total root dry weight, corn was considerably more responsive to the alcohol treatment than peas. Yet, the promotive effect of ethanol on cell elongation appeared not to differ significantly between the two types of plants. These results support the concept that dilute ethanol may materially affect growth and metabolism in plants where it is used as a solvent for certain growth regulating substances.

(84)

A Numerical Evaluation of the Cells of the Corpora Lutea of Pregnancy of the Golden Hamster (*Mesocricetus auratus* Waterhouse)

CHARLES A. CATCHING AND WILLIAM W. NORRIS, JR., *Northeast Louisiana State College*

The weight and absolute cell numbers of developing hamster corpora lutea were measured at 3, 6, 9, 12, and 15 days of pregnancy. The weight of the corpora lutea increased from approximately 0.00025 g. at 3 days to approximately 0.00130 g. at 15 days. The corpora lutea were homogenized and the nuclei counted in a hemocytometer. The total number of cells per corpus luteum increased from day 3 to day 6 and from day 6 to day 9, appeared to decline from day 9 to day 12, and declined rapidly from day 12 to day 15. The number of luteal and non-luteal cells per corpus luteum followed a similar pattern. The percent luteal cells averaged near 30% for all corpora lutea evaluated.

(61)

Hydro-economy of *Astragalus tennesseensis* (Leguminosae)

CAROL CAUDLE AND ELSIE QUARTERMAN,
Vanderbilt University

Astragalus tennesseensis Gray is a herbaceous perennial legume endemic to the cedar glades of Middle Tennessee and northern Alabama. During the summer, when the shallow layer of soil in the cedar glades becomes very dry, *A. tennesseensis* does not become dormant but remains active. An investigation to determine the adaptations of *A. tennesseensis* to this seasonally-arid habitat included transpiration studies. Results indicate that transpiration rates were greatly reduced when soil moisture was near permanent wilting percentage. However, prolonged exposure of plants to drought conditions, produced by different intervals of watering, did not reduce transpiration rates per unit area of leaf at the conclusion of drought conditions. Plants responded to drought periods of 9 days or longer by losing leaves. Thus, reduction of total transpiring surface to achieve hydro-economy is an adaptation of *A. tennesseensis* to its seasonally-arid habitat.

(137)

Some *In Vitro* Effects of Potassium and Sodium Thiocyanate on the Notochord of *Rana catesbeiana* Larvae

SANDRA P. CHEEVERS AND ROY HUNTER, JR.,
Atlanta University

Several *in vivo* studies on the notochord have demonstrated the remarkable ability of this structure to become hyperdeveloped in the presence of thiocyanate ions and other animalizing substances. Generally, these ions did not produce hyperdevelopment in the ectodermal and endodermal regions of the embryo, but did transform cells of the somite region into notochord. In order to study the *in vitro* effects of thiocyanate ions, axial cylinders were removed from excised tails of *Rana catesbeiana* larvae. After the notochords were removed from their sheaths, groups of them were cultured from 48-120 hr. at 37° C. in various solutions of potassium and sodium thiocyanate, dissolved in Dextrose-Holtfreter's fluid. Tissues showed pycnotic nuclei, an increase in cell number, and no observable change in normal DNA and RNA activity. Chondrification of the notochord was observed in the controls as well as the experimentals. It was concluded that sodium and potassium thiocyanate produced "limited" cell senescence, and induced hyperdevelopment of the notochord.

(191)

Four Tropical Forests of Eastern Panama: A Structural Comparison

GEORGE I. CHILD, *University of Georgia*

The structure of four distinct tropical forests in eastern Panama were compared. The forest types were typical of a wide range of tropical environments viz., salt and brackish water swamps, freshwater swamps, lowland areas, and wet montane conditions. Studies were conducted on ¼ ha. sites in conjunction with biomass studies. Structural characteristics compared included; stratification, DBH-Height relationships, maximum tree heights, DBH distributions, basal areas, spatial distribution, canopy cover, abundance of individuals, leaf surface areas, and gross physiognomy.

(41)

The Woody Flora of Alabama

ROSS C. CLARK, *University of North Carolina at Chapel Hill*

On the basis of field work accomplished within the past two seasons, there is now more material available for forming working hypotheses regarding the distributions of woody taxa in Alabama. Extensive collections of the woody plants have been made in all but four counties of Alabama, which were judged beforehand to be fairly well-collected. These collections amount to over 10,000 numbers. Several types of distributional patterns are now recognizable, and it is possible to relate some of them to geology and other factors. Additional patterns should emerge with further study of some of the difficult genera, and supplementation of distributional records from major herbaria in the Southeast. It is hoped that collections from adjacent states will also help to augment understanding of the distributions of Alabama woody plants.

(47)

A Technique for Counting Saprolegniaceous Propagules in a Water Sample

JOHN CLAUSZ, *University of North Carolina*

A plating technique for obtaining quantitative data on the concentration of Saprolegniaceous propagules in samples of water was devised. A 10 ml. water sample was injected into 15 ml. of melted and cooled corn meal agar (CMA) containing antibiotics (100 mg./l. penicillin G and 200 mg./l. streptomycin sulfate). The agar was made up with 60% of the recommended volume of water. Experimentation showed that CMA containing antibiotics was the best culture medium. After 18 hours the inoculated agar plate was examined for germlings of species of the Saprolegniaceae which, when found, were removed and cultured for identification. By combining this technique with continuous-flow centrifugation, it was possible to determine the number of propagules in large volumes of water collected from the field. Enumeration by this technique disclosed that species exhibit periodic occurrence and variation in patterns of propagule distribution within the body of water studied.

(16)

Effect of Tween 80 and DMSO on the Absorption and Translocation of Three Phloem-Mobile Herbicides in *Verbascum thapsus* L.

G. E. COATS AND C. L. FOY,
Virginia Polytechnic Institute

Intermediate leaves of common mullein plants (8 to 10-leaf stage) were treated with 10 ul (0.1 uc) of either ¹⁴C-labeled picloram (4-amino-3,5,6-trichloropicolinic acid), dicamba (2-methoxy-3,6-dichlorobenzoic acid) or 2,4-D (2,4-dichlorophenoxyacetic acid). Each compound was tested alone and in combination with 0.5% Tween 80 (nonionic surfactant containing polyoxyethylene sorbitan monooleate), 30% DMSO (dimethylsulfoxide), or both additives. Wetting and penetration were obviously impaired by the hirsute character of the leaf surface. In general, absorption and translocation of all three herbicides were relatively poor as indicated by autoradiography and counting. Picloram and dicamba appeared to be slightly more mobile than 2,4-D. Uptake and mobility of all three herbicides was facilitated slightly by addition of Tween 80. DMSO penetrated poorly, evaporated slowly and did not enhance the up-

take of either herbicide. Tween 80 alone was apparently as effective as the combination of both additives.

(160)

Action of Puromycin Dihydrochloride on Protein Synthesis and Mitosis

MADISON B. COLE, JR., ADA A. COLE, AND
J. GORDON CARLSON, *The University of Tennessee*

Incubation of embryos of the grasshopper, *Chortophaga viridifasciata* (DeGeer), in 10 ug of puromycin per ml of culture medium for less than 1 hr inhibits the incorporation of DL-leucine-4,5- H^3 into neuroblasts, as demonstrated by autoradiography. On the other hand, exposure to as much as 100 ug puromycin per ml of culture medium for up to 6 hr, does not alter the percent of neuroblasts in midmitosis (prometaphase + metaphase + anaphase). The percent of midmitotic neuroblasts is increased significantly by exposure to 2×10^{-6} M colchicine for 4 hr when compared with a 1 hr exposure, but with the addition of 10 ug puromycin per ml of colchicine-containing medium, no significant difference can be detected. Our interpretation is that inhibition of protein synthesis by puromycin blocks the mitotic progress of neuroblasts both into and out of midmitosis. (This study was supported in part by Atomic Energy Commission Contract AT-40-1-2575).

(153)

Helminths of *Natrix* spp. and *Agkistrodon piscivorus* in Eastern North Carolina (Reptilia: Ophidia)

RICHARD F. COLLINS, *Wake Forest University*

Studies were conducted on the incidence and distribution of helminths in *Natrix s. sipedon*, *Natrix s. fasciata*, *Natrix erythrogaster*, *Natrix taxipilota*, and *Agkistrodon piscivorus*. *Natrix* spp. contained the following:

Trematoda: 7 species; Cestoda: 1 species; Acanthocephala: 1 species; Nematoda: 2 species. *Agkistrodon piscivorus* contained the following: Trematoda: 3 species; Cestoda: 2 species; Acanthocephala: 1 species; Nematoda: 2 species; Pentastomida: 1 species. The snakes from ponds and streams were more heavily infected, both with individual species and total numbers, than were the snakes from swamps. New locality and host records are recorded.

(71)

Uptake of Amino Acids in Natural Water

CLAUDE C. CRAWFORD, *N. C. State University*

When low concentrations of ^{14}C -labeled amino acids were added to natural waters they were found to be taken up by the bacteria. Their uptake followed the Michaelis-Menten enzyme-substrate equations. From these calculations the turnover time, that is the time required for removal of all the substrate, and a maximum value for velocity of uptake of natural substrate and for natural substrate concentration can be found. In an estuary during August, arginine had a turnover time of 5.5 hrs while glycine took 29.4 hrs.

In one estuarine experiment the natural substrate concentrations were known and actual velocities of uptake could be found. Glycine, valine, serine, and methionine were found to be most important in the flux of amino acids through the dissolved organic fraction.

(146)

Nonspecific Esterase Activity in the Caecum of *Haematoloechus medioplexus*

DONALD A. DAVIS, B. J. BOGITSH AND D. A. NUNNALLY,
Vanderbilt University

The cytochemical localization of nonspecific esterase was investigated in the frog lung fluke, *Haematoloechus medioplexus*. Cryostat sections of fixed or fresh material were incubated in Holt's bromoindoxyl acetate medium at pH 5.4. Inhibitors or activators such as NaF, AgNO₃, Eserine Sulfate, PCMB (p-chloromercuribenzoate), β -phenyl propionic acid or E600 (diethyl-p-dinitrophenyl phosphate) were incorporated into the basic substrate medium. The enzyme was found to be organophosphate resistant and activated by PCMB. It was primarily localized as droplets dispersed irregularly in the gastrodermal lining rather than in the lumen of the gut. The possible significance of this enzyme in the digestive process will be discussed. (Supported, in part, by National Science Foundation Grant GB-4742.)

(166)

The Ultrastructure of Irradiated Microspores

H. L. DAVIS AND A. V. BEATTY, *Emory University*

Inflorescences of *Tradescantia paludosa* were irradiated with various doses of x-rays. The anthers were ruptured and the microspores fixed in buffered glutaraldehyde-osmium tetroxide or potassium permanganate prior to embedding. The microspores were embedded in a mixture of Araldite and Epon and sectioned at approximately 600 Å using a Porter-Blum ultramicrotome, model MT-2. Sections were examined for ultrastructural morphology with a Zeiss electron microscope, model EM 9a. Examination revealed little change in the gross morphology of the microspores, however changes in ultrastructure of cytoplasmic organelles were observed.

(136)

Mean Weights of Chick Embryos Correlated with the Stages of Hamburger and Hamilton

J. E. DAVIS, JR., AND NORMAN E. GARRISON,
Wake Forest University

A total of 1125 normal chick embryos, representing 25 each of the 45 stages of Hamburger and Hamilton, were removed, fixed in Boulin's solution, stored in 70% ethanol and weighed with a semi-micro analytical balance. Entire blastoderms of stages 1-8 were weighed, whereas only embryos-proper were weighed in stages 9-45. As a consequence, results constituted two groups, each of which showed a geometric rate of growth marked only by minor deviations which were related to specific events of normal growth and development.

(187)

Cycling of Radiostrontium by Loblolly Pines (*Pinus taeda* L.)

BRUCE R. DAYTON, *University of North Carolina and Savannah River Ecology Laboratory*

Seven loblolly pines (3-4 in. d.b.h.) were stem-inoculated in July 1966 with 3 millicuries each of radiostrontium and the cycling of the element studied until November 1967. Movement of strontium through the pine-dominated ecosystem was relatively slow. Very little turnover of the element occurred by foliar leaching or by excretion or leaching from roots, most of the turnover occurring by needle fall. At the conclusion of the study the element was distributed in the system in

the following manner: 37.3% in wood; 53.7% in foliage; 8.8% in litter and understory vegetation; <1% in soil and fibrous roots. Compartmental rates of radiostrontium accumulation over the last 12 months of the study (-57.8% in wood; +665% in foliage; +1885% in litter) indicate that strontium and other alkaline earth elements tend to accumulate in the litter of young pine stands.

(65)

Distribution and Production of the Macrobenthic Flora of a North Carolina Estuary

C. R. DILLON, *University of North Carolina*

Two vascular and nine algal species comprise the macrobenthic flora of Bogue Sound, North Carolina. These species occurred in 55% of the sample plots, ranging in density from one individual to four thousand individuals m^{-2} . *Zostera marina* L. contributes 87.3% of the total production of this flora. Production increases as water depth decreases from east to west. Macrobenthic organic production is estimated to be 799 kcal $m^{-2} yr^{-1}$.

(92)

Effects of Five Insecticides on the Oxygen Consumption of Bluegill Sunfish, *Lepomis macrochirus*

BOBBY F. DOWDEN, *Louisiana State University in Shreveport*

The effects of three concentrations (0.1, 1.0, and 5.0 parts per billion) of five insecticides (chlordane, DDT, lindane, malathion, and parathion) were measured in a flow-through respirometer and analyzed statistically. There were highly significant differences between the effects of the insecticides on bluegill oxygen consumption, regardless of concentration. Statistical differences were also noted between the effects of the three concentrations of the five insecticides tested. The statistical analyses showed that each of the insecticides tested acts differently over the range of concentrations tested. No statistical differences were noted in the comparisons of the effects of elapsed time with the insecticides without consideration of concentration and of concentrations without consideration of insecticides.

During the tests, the fish were noted to produce great quantities of mucus when exposed to the chlorinated hydrocarbon insecticides, lesser amounts in the organic phosphorus insecticides, and relatively little in the controls.

(39)

Natural and Artificial Pollination in Southeastern U.S. *Matelea* (Asclepiadaceae)

DONALD J. DRAPALIK, *The University of North Carolina*

The natural pollinators of *Matelea* are small flies belonging to the families Chloropidae and Milichiidae. While a fly is obtaining nectar, a pollinium apparatus may get attached to the fly's proboscis. As this fly visits another nectary the attached pollinium may get lodged against an anther slit ensuring pollination. While natural hybrids appear to be rare, different species can be crossed experimentally. With the aid of a dissecting scope in the field artificial pollination was conducted using the species cited under *Odontostephana*, Alexander in Small, *Manual Southeast Flora*. In general the plants are self-incompatible. The following F_1 hybrids have been produced and grown to the flowering stage: *M. carolinensis* X *M. flavidula*, *M. carolinensis* X *M. bald-*

wyniana, *M. baldwyniana* X *M. obliqua*, and *M. obliqua* X *M. decipiens*. Preliminary findings show that some of the F_1 plants appear to be fertile since F_1 plants from the last two of the above hybrids produced outcross fruit in the Botanical Garden during summer 1967.

(190)

A Structural Description of Second Growth Vegetation in Eastern Panama

MICHAEL J. DUEVER, *University of Georgia*

Three stages of second growth vegetation in eastern Panama were intensively studied during July and October, 1967. The sites were located in areas used for Milpas or "slash and burn" agriculture. The stages represented two, four, and six years of regrowth after cultivation. On each study area, of $\frac{1}{4}$ hectare, all vegetation was cut, sorted into compartments by structural characteristics, and weighed. Roots, litter, and soils were also sampled and described. The three regrowth stages and second growth in other parts of the tropics were compared using the wet and dry weight biomass by compartments, canopy heights, light penetration, composition, and other structural characteristics.

(126)

Preliminary Survey of Introduced Molluscs of Eastern North America

DEE S. DUNDEE, *Louisiana State University*

A project involving the cataloging of the land and freshwater molluscs which have been introduced into North America (east of the Rockies) is underway. Attempts will be made where possible to determine if the introduction has become established.

(189)

Leaf Epiphytes and Nitrogen Fixation

JOE A. EDMISTEN, REX CRAIG, MIKE HARRELSON, JANE WATTS, *University of Georgia*

Surveys have been made of leaf organisms (epiphyllae) of tropical rain forests in Puerto Rico, Panama, Colombia, and Peru. Bacteria, fungi, lichens, algae, and liverworts have been isolated and identified from intact leaves in the field and in Athens. Leaf fungi include Phycomycetes, Ascomycetes and Deuteromycetes; algae include *Trentepohlia*, *Phycopeltis*, and several bluegreens. Lichens are chiefly *Strigula* and liverworts include *Radula* of Lejeuneaceae. Microkjeldahl tests show higher nitrogen content in epiphyllae than in host leaves. ^{15}N experiments in Puerto Rico showed that mixed epiphyllae fixed about 10% of their total nitrogen from $^{15}N_2$ during a 48-hour exposure period. The leaves from which the epiphyllae were scraped had 1% of their total nitrogen as ^{15}N suggesting transfer. The successional sequence of epiphyllae establishment is being studied. Attempts are being made to grow N_2 -fixing epiphyllae on crop plants such as *Citrus*. Ektachrome and infrared slides of epiphyllae will be shown.

(38)

Genetic Fruit Polymorphism in *Valerianella umbilicata* (Sull.) T. & G. (Valerianaceae)

DONNA MARIE EGGERS, *Vanderbilt University*

Valerianella umbilicata (Sull.) T. & G., *V. patellaria* (Sull.) T. & G., and *V. intermedia* Dyal present a common distributional pattern throughout most of eastern North America. Distinct differences in fruit morphology are all that distinguish these plants, commonly found

growing mixed together in various combinations. When patellaria-type fruits from a population containing all three entities were sown, some of the progeny produced patellaria-type fruits, but others produced umbilicata-type fruits. When umbilicata-type fruits from this same population were sown, some plants produced umbilicata-type fruits, but others produced intermedia-type fruits. This, plus data from other populations studied, indicates that these entities are three fruit-forms of one species, genetically polymorphic with respect to fruit morphology. Since *V. umbilicata* is the oldest epithet, the appropriate names are *V. umbilicata* forma *umbilicata*, *V. umbilicata* forma *patellaria*, and *V. umbilicata* forma *intermedia*.

(159)

Chromosome Aberrations in the Cells of Chinese Hamster (*Cricetulus griseus*) Embryos after Paternal X-Radiation

R. H. FETNER AND M. V. ZEHR,
Georgia Institute of Technology

Preliminary experiments have been designed to determine if irradiation of male hamsters will result in chromosome aberrations being produced in the embryonic tissue of their progeny, and to determine the frequency and types of such aberrations. Adult males were irradiated with 400 rads of 250 kv x-rays delivered at 80 r per minute and then mated with proven females. Gravid females were sacrificed after 12 days, individual embryos were minced and grown *in vitro* for 5 days, at which time slide preparations were made for metaphase analysis. Karyotype analyses of all readable metaphases were made for each preparation and cells were classified as to the type and frequency of chromosome aberrations they contained. These preliminary findings will be presented.

(131)

The Subspecies of the Crawfish *Procambarus hagenianus* (Faxon) (Decapoda; Astacidae)

J. F. FITZPATRICK, JR., *Mississippi State University*

In 1938 (*Iowa St. Coll. J. Sci.*, 13: 75-76) Lyle indicated that the burrowing crawfish *Procambarus hagenianus* (Faxon) exists in four identifiable subspecies by the publication of *nomina nuda*. No subsequent data were published. Because of the habits of the animal, collection of specimens is difficult, and Lyle's specimens were lost. Lyle's specimens were found by the writer, additional specimens collected, and the species studied. Peculiarities of the male and female chela, the antennal scale, and apparent substrate preference validate the subspecies as indicated by Lyle (*op. cit.*). (Supported in part by NSF Grant GB-4719).

(121)

Pattern of Incorporation of Labeled Nucleic Acid Precursors in Wheat Root Pericycle¹

D. E. FOARD, *Oak Ridge National Laboratory*

Autoradiographs of wheat root sections reveal that tritiated thymidine and tritiated uridine, although incorporated into different cell parts, have similar incorporation patterns when observed at the tissue level. In seminal roots longer than 10 mm, cells of basal regions are unlabeled with two exceptions: (1) scattered cortical and vascular parenchymatous cells and (2) cells in localized regions of the pericycle where lateral roots are arising. The labeling pattern in the pericycle is interesting because it closely parallels certain cytological changes. Cells are intensely labeled in the apical region of the

pericycle; these cells are rich in cytoplasmic structure and are growing and dividing. Cells are unlabeled in basal regions; cytoplasmic structure becomes degenerate, and growth and cell division cease. Localized groups of labeled cells appear in basal regions of the pericycle where, associated with lateral root initiation, cytoplasmic structure is rejuvenated, and cell division and growth occur.

¹ Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.

(91)

Hybridization of *Peromyscus* and Human Hemoglobins

CHARLES W. FOREMAN, *University of the South*

Mixtures of specific hemoglobins were dialysed at low pH to effect dissociation into subunits. The subunits were then allowed to recombine slowly by dialysis at neutral pH. Human and different specific *Peromyscus* hemoglobins recombined in this manner yielded hybrid molecules of electrophoretic mobility different from those of any parental hemoglobins. Mixtures of different specific *Peromyscus* hemoglobins treated similarly yielded no electrophoretically separable recombinants. These results are consistent with the hypothesis that *Peromyscus* hemoglobins share either an alpha or a beta chain of identical electric charge.

(62)

Utilizing the Pattern of Growth of *Juncus roemerianus* to Estimate Net Leaf Production

WILLIAM A. FOSTER AND LINDA STROUD,
North Carolina State University

The living and total lengths of individual leaves were measured repeatedly at approximately monthly intervals under field conditions. Leaves with 2.5 cm or less dead material were classified as green and those with more than 2.5 cm dead but with some green were classified as green-dead. The rate of growth of the whole leaf and the rate of death of the living portion were much greater in the summer than in the winter. Consequently the rates of transfer of leaves from the green to green-dead and from the green-dead to dead categories were much greater in the summer than in the winter. The number of green and green-dead leaves present at seven sample periods was obtained from clip-plot samples. Net leaf production can be calculated by combining the rates of transfer between categories with the number of leaves present at the beginning of each time interval.

(15)

Residue Studies with a ¹⁴C-labeled Endothall Defoliant Formulation in Cotton

C. L. FOY AND D. E. SEAMAN,¹ *Virginia Polytechnic Institute and Syracuse University Research Corporation*

Portions of mature greenhouse-grown cotton (*Gossypium hirsutum* L.) were sprayed with a defoliation-accelerating formulation containing ¹⁴C-labeled 7-oxabicyclo [2.2.1] heptane-2,3-dicarboxylic acid (endothall). Absorption, distribution and residue patterns of ¹⁴C were determined by autoradiography and liquid scintillation counting (following Schöeniger flask combustion). Variables studied were (a) test location (plant populations having different histories and boll loads); (b) defoliant formulation (alone and in 1:1 combination with commercial tributyl phosphorothioate defoliant); (c) rate

of defoliant (recommended rate and twice the amount); (d) spray volume (10 and 25 gpa, simulating air and ground application, respectively); and (e) harvest date (3 and 10 days after treatment). Plant parts above and below the treated portion contained radioactivity in general distribution, indicating translocation of endothall-¹⁴C metabolites. Fuzzy seed coats contained radioactivity either from direct spraying or contamination during mechanical delinting. Seed coats from acid delinted samples were free of radioactivity, with one exception. Seed meats contained no detectable ¹⁴C residues.

¹ Both authors, formerly University of California, Davis, California.

(52)

Studies on Soil Fungi from West Pakistan

LAFAYETTE FREDERICK, *Atlanta University*,
CHESTER R. BENJAMIN, *USDA, Beltsville, Maryland*, and
JOSEPH C. WHITE, *Atlanta University*

Cooperative studies are being conducted on the composition of the mycoflora in Pakistanian soils. Several isolation techniques and a variety of culture media are being employed in these investigations. Imperfect fungi have been found to be the predominant forms with *Aspergillus*, *Penicillium*, and *Fusarium* species the most abundant. Next in frequency of occurrence are species representing the genera *Paecilomyces*, *Ulocladium*, *Curvularia*, *Helminthosporium*, *Fusidium*, and *Trichoderma*. Among the species of *Aspergillus* isolated some are especially noteworthy and may represent hitherto undescribed species. Other unusual and rarely reported imperfect fungi isolated include *Acrophialophora nainiana*, and species in the genera *Hansfordia* and *Beauveria*. Noteworthy ascomycetous isolates include species of *Emericella* and an apparently undescribed homothallic species of *Neurospora*. A noteworthy zygomycetous fungus isolated is the rarely reported *Zygorhynchus japonicus*. (Research supported by Agricultural Research Service Cooperative Research Contract No. 12-14-100-8390 (34), U. S. Department of Agriculture.)

(128)

Psammolittoral Gastrottricha (Macrodasyoidea) of the Mississippi Sound Area

JAMES J. FRIAUF, *Vanderbilt University*

Few studies concerning the marine interstitial fauna of North American coasts have been undertaken, and this is especially true for the Gulf of Mexico with particular regard to the Gastrottricha. A preliminary report is given on a survey conducted during the summer of 1967 to ascertain, as fully as possible, the psammolittoral macrodasyoid species in the Mississippi Sound area. Those found within the genera *Tetranchyroderma*, *Turbanella* and *Acanthodasys* are indicated. Some physical and chemical parameters of the sampling stations also are discussed briefly.

(23)

Phosphofructokinase and Glycolysis in the Corn Scutellum

L. A. GARRARD AND T. E. HUMPHREYS,
University of Florida

In slices of the corn scutellum, a strong aerobic alcoholic-fermentation is triggered by the addition of glucose or fructose to the ambient solution. Glycolysis in these slices does not appear to be controlled at the point of phosphorylation of fructose-6-phosphate by phosphofructokinase (PFK). The properties of the corn scu-

tellum PFK are discussed in relation to changes in metabolic intermediates during an increased rate of glycolysis. It is suggested that in the absence of exogenous sugars the rate of glycolysis is limited by the rate at which endogenous substrates become available.

(176)

Specific Gravities of Microorganisms

STEPHEN M. GITTLESON, *University of Kentucky*

Specific gravities of microorganisms have been studied by determining in which concentrations of Renografin-76 solutions (Squibb, methylglucamine diatrizoate) organisms become suspended. The pycnometer method was used to measure specific gravities of these Renografin solutions at 14°, 20°, and 26° C.

The protozoa — *Polytomella agilis*, *Polytomella caeca*, *Euglena gracilis* v. *bacillaris*, *Tetrahymena pyriformis*; yeast — *Saccharomyces cerevisiae*; bacteria — *Vitreoscilla* sp. strain UNH-L, *Bacillus cereus* strain T (vegetative) and *Bacillus cereus* strain T (dormant spores) have specific gravities respectively of 1.020, 1.020, 1.040, 1.060, 1.080, 1.060, 1.240 and 1.320. The higher specific gravity of *Bacillus cereus* spores compared with vegetative forms may be associated with a higher content of calcium-dipicolinate and dehydration of the spore. Generally, bacteria and yeast with thicker cell walls are more dense than protozoa which contain larger amounts of lipid. (This study has been supported by the University of Kentucky Research Foundation.)

(22)

Cancelling Errors in the Quantitative Determination of α -Amylase Activity

ALAN H. HABER AND LARRY L. TRIPLETT,
Oak Ridge National Laboratory

Determination of α -amylase activity using starch-iodine color has been based on absorbancy decreases being proportional to enzyme concentration and reaction time. Provided the reagent-blank absorbancy is proportional to starch concentration, we find the enzyme-induced absorbancy decrease is proportionately greater for smaller than for larger values of the product of enzyme concentration and reaction time, which product is nevertheless constant for any given absorbancy decrease. Previous findings that the absorbancy decrease appeared proportional to enzyme concentration and time may be explained by combining this error with a second possible error: lack of proportionality between absorbancy and starch concentration apart from any hydrolysis. The two errors tend to cancel each other. Since determinations should not depend upon cancelling errors, quantitative assay should not be based upon the magnitude of the absorbancy change but upon the constant product of enzyme concentration and reaction time to produce a given absorbancy change. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(74)

A Colorimetric Method for Determining Oxygen Concentration in Terrestrial Systems

MARY H. HAECKER, ROBERT J. BEYERS, AND
MICHAEL H. SMITH, *Savannah River Ecology Laboratory*

This method utilizes essentially the same principles of the manganous hydroxide potassium iodide oxidation-reduction reactions (Winkler method) for determining concentrations of oxygen in water. The method has been adapted for use with samples of gas. The amount of iodine released in the reaction is directly proportional to

the oxygen concentration in the sample. The relationship between absorbance at 500 mμ and O₂ concentration is linear ($r = .99$). This technique is especially valuable for field research and is accurate over a relatively wide range of oxygen concentrations.

(54)

Growth Rate of the Lichen *Parmelia caperata*

MASON E. HALE, *Smithsonian Institution*

Growth rates of *Parmelia caperata* on rocks in the vicinity of Washington, D.C., have been measured for a continuous period of almost three years. Photographs are being taken at intervals of three days to six weeks, and using large prints as a base the rates can be determined with an accuracy of 0.01 to 0.10 mm. In general growth appears to be stepwise, occurring during periods of precipitation and as long thereafter as the plants remain moist but ceasing for as much as 2-3 weeks in dry spells. The strongest correlation is with length of cloudy period that follows rainstorms rather than with total amount of rain. There is measurable growth in every month. Total annual growth is near 8 mm and maximum rates are of the order of 1.5 mm per month.

(108)

Loss of Organic Compounds from *Arachis hypogaea* L. Growing in Gnotobiotic Conditions

M. G. HALE, *Virginia Polytechnic Institute*

The loss of organic compounds from plants is a well documented occurrence. Loss may occur from all organs and most of the compounds found within plants have been found outside living plants under one condition or another. Such compounds have been implicated in ecological relationships which involve interactions between plant-and-plant, and between plant-and-microorganisms. Little information is available on quantities released, effects of various environmental factors on this release, and the sources of released compounds. In quantitative and qualitative studies it is necessary to resort to aseptic culture techniques because of the possibility of rapid degradation of these organic compounds by microorganisms. Techniques of aseptically culturing peanut plants, *Arachis hypogaea* L., results of analyses of materials released from roots and fruits and their possible significance will be discussed.

(51)

Uncommon Soil Fungi Isolated from Peanut Fruits in the Southeastern United States

RICHARD T. HANLIN, *University of Georgia*

During a survey of the fungous flora of peanut (*Arachis hypogaea* L.) fruits grown in six southeastern states, several fungi were isolated which appear to be uncommon in this area. Four of these fungi are described here. All were isolated from peanut fruits that had been surface-sterilized to eliminate external fungi. *Scytalidium lignicola* Pesante (Dematiaceae) was found in peanuts in North Carolina, Alabama, and Virginia; *Trichurus spiralis* Hasselbring (Stilbaceae) was found in Virginia peanut seed; *Starkeyomyces koorchalomoides* Agnihotrudu (Tuberculariaceae) was isolated from peanut fruits in Georgia, North Carolina, Virginia, Oklahoma, and Texas; and a white mutant of *Aspergillus flavus* Link ex Fr. was found on peanut seed in Georgia.

(130)

Epidermal Morphology of *Corvomeyenia* sp.

FREDERICK W. HARRISON AND FELIX H. LAUTER,
University of South Carolina AND Presbyterian College

Specimens of the fresh-water sponge *Corvomeyenia* sp. were grown in the laboratory on microscope slides or on cover slips. The outgrowth region of tissue was separated from the original sponge. Fixed outgrowths were stained by various histological and histochemical techniques. Living outgrowth preparations were studied with phase contrast microscopy. These studies show that epidermal regions of *Corvomeyenia* sp. are normally cellular. Local areas of the upper epidermis may be syncytial when undergoing reduction. All ameboid cell types are present upon the surface of the upper epidermis. Porocytes are present. Pinacocytes are sometimes nucleolate. Pinacocytes are characterized by little histochemically demonstrable cytoplasmic RNA, carbohydrate, or lipid. Basal pinacocytes utilize filopodia and lobopodia in phagocytotic activities. Acid phosphatase activity in these cells is possibly localized in phagosomes.

(184)

Movements of the Eastern Worm Snake, *Carphophis amoenus amoenus*

MICHAEL J. HARVEY, JAMES W. HARDIN,
Memphis State University, AND
ROGER W. BARBOUR, *University of Kentucky*

Movements of ten eastern worm snakes (*Carphophis amoenus amoenus*) were studied using radioisotope tagging and tracing techniques. The study was conducted at Robinson Forest, Breathitt County, Kentucky, from early May to late October, 1966. Snakes were tagged subcutaneously, using a hypodermic needle and plunger apparatus, with 50-80 microcurie Co⁶⁰ alloy wire tags. Detection apparatus consisted of a model 489 Thyac II survey meter equipped with earphones, shoulder strap, and scintillation probe mounted at one end of a 3 m tubular aluminum pole. Each snake was located 46-89 times. Home ranges were calculated using the minimum area method and averaged 253 m² (range, 23-486 m²). The longest known movement during a 24 hr period was 45 m (in 14 hr 30 min). Most movements were made at night. Periods of inactivity ranged from a few minutes to over 14 days. Snakes displaced distances of 150, 400, and 800 m from where captured, exhibited no homing ability.

(32)

The Phytotron: A Tool for Botanical Research in the Southeast

HENRY HELLMERS, *Duke University*

The two unit Phytotron at Duke University and North Carolina State University is currently undergoing final testing. By late spring it will be ready for full use as a botanical research tool. The physical facilities of the Southeastern Plant Environment Laboratories, as the phytotron is officially named, will be described. Approximately 100 individually controlled environmental areas will be available for growing and testing plants. The criteria for establishing and the accuracy of controlling the various parameters of the environment will be presented. Examples of some types of experiments that best can be conducted in the phytotron will be discussed.

(29)

Manometric Measurement of Turgor Pressures in the Bole of Slash Pine

FRANK A. HELSETH, *Southeastern Forest Experiment Station, Olustee, Florida*

Oleoresin exudation pressure (O.E.P.) in slash pine (*Pinus elliottii* Engelm.) results from (1) the quantity of oleoresin in the duct and (2) turgor pressure changes in the epithelial cells lining the ducts. The quantity of oleoresin in a single tree can be considered as constant for short periods of time. However, there is considerable variation among trees which may influence the minimum O.E.P.

The diurnal patterns of O.E.P. clearly reflect dehydration and rehydration of cells and tissues. Pressures are maximal (9-12 atm.) just at dawn and minimal (3-5 atm.) in the afternoon, corresponding to increases in moisture stress. Upon opening of the stomates in the morning, pressures begin to decrease rapidly in the upper crown, proceeding basipetally with the transmission of moisture tensions down the bole. These diurnal pressure changes are positively correlated with atmospheric relative humidity and negatively correlated with changes in temperature and needle moisture stress (by pressure bomb). Pressures at the base of the bole normally exceed those in the crown, the gradient usually approximating 1 atm./10 m. at night and increasing during the day.

(14)

Extraction and Partial Identity of Unknown Phenolic Derivative in *Avena* Coleoptile

JAMES H. M. HENDERSON AND CECILIA PHILLIPS, *Tuskegee Institute*

Flavonoid complexes extracted from dark-grown *Avena* coleoptiles were isolated by column chromatography, yielding two fractions, designated as B and C. Ultraviolet spectral analysis of the fractions revealed absorption maxima at 227, 275, 281, and 267 millimicrons for fraction B, and one absorption peak at 255 millimicrons for fraction C. Paper chromatography of the two fractions gave R_f values of 0.9, 0.43, and 0.20 for fraction B, and 0.92 and 0.20 for fraction C.

These fractions and their alkaline and acid hydrolysates were assayed using the *Avena* first internode test and compared with similar assays of synthetic flavanoids, kaempferol and quercitin. The results indicate that both of these exhibit a stimulatory effect on the growth of excised internode sections, but only in the presence of exogenous indoleacetic acid.

The data obtained from the assays of the unknown compounds reveal that fraction B contains a factor which stimulates elongation in the presence of indoleacetic acid. These results are analogous to those obtained with kaempferol and quercitin. Based on previous evidence by physical methods, the tentative conclusion may be made that the unknown factor in the extracts of *Avena* coleoptile is kaempferol.

(134)

The Poison Apparatus of *Dasymutilla occidentalis* (Hymenoptera: Mutillidae)

HENRY R. HERMANN, *University of Georgia*

The basic constituents of the poison apparatus of *Dasymutilla occidentalis* (L.) are similar to those found in most other hymenopterous insects. However, several of the sclerites have undergone some modification so that the apparatus functions as an extremely important defensive mechanism.

(127)

Omalonyx unguis (Gastropoda: Pulmonata: Succineidae) from Ecuador

PAT W. HERMANN, *University of Georgia*

Life history data on the snail, *Omalonyx unguis* (Férussac), are presented, including habitat, food preference, and reproduction.

(169)

Some Effects of Low Temperature Treatment on Sporocarp Germination and Gametophyte Development in *Marsilea* L.

J. M. HERR, JR. AND DAVID H. REMBERT, JR., *University of South Carolina*

Scarified sporocarps of *Marsilea* sp. placed in water and subjected to a temperature of 40° F (4.4° C) for 42 hours germinated slowly to produce elongated sporophores. Megaspores and microspores were released approximately 2 hours after the germinated sporocarps were returned to room temperature. Within the next 24 hours, the megaspores produced mature megagametophytes with protruding archegonia. Concomitantly, the microspores produced endosporic microgametophytes. With dehiscence of the microspore walls, however, whole antheridia instead of motile sperm were shed. Later, the antheridia released spherical sperm apparently none of which achieved motility and function. In the next 48 hours, most of the archegonia enlarged markedly in simulated calyptra development. Of these archegonia, designated calyptroids, many became chlorotic and gradually disintegrated. Several calyptroids, apparently through apogamy, formed sporophytes which were characteristically slow in growth and short lived. These apogamous plants otherwise departed from the features of typical, diploid sporophytes in pattern of growth, vascular distribution, and structure of the early, spatulate leaves.

(58)

Autecological Study of Roadside and Field-Pasture Populations of *Helenium amarum* (Raf.) H. Rock

VIOLET ANN HICKS, *University of N. C. at Chapel Hill*

Helenium amarum (Raf.) H. Rock, the common sneezeweed or bitterweed occurring throughout the coastal and piedmont areas of the Southeast, has been observed to differ greatly in appearance. When roadside populations of bitterweed are compared with field and pasture populations, the former are considerably shorter, have fewer branches and flower heads, etc. Autecological studies were conducted comparing 15 roadside populations and 15 field-pasture populations to discover whether the distinctions observed in the natural populations are due entirely to environmental conditions. In an attempt to determine if these populations are simply ecophenes, seed germination, growth-chamber, greenhouse, and botanical garden experiments were established. In several studies differences in appearance of the populations were retained in the progeny grown from seed.

(151)

The Possibility of Host Specificity in the Genus *Ornithocythere* (Ostracoda, Entocytheridae)

H. H. HOBBS, III, *Mississippi State University*

The discovery of a new species of the ostracod genus *Ornithocythere* in Northern Mississippi presents evidence

for the possibility of host specificity in the family Entocytheridae. *O. waltonae* Hobbs, Jr. is commensal with *Procambarus a. acutus* and *Cambarus d. diogenes* at the type locality. Elsewhere, it is found only on *C. d. diogenes*. Likewise, the new species found in Mississippi is also in association only with *C. d. diogenes*.

The general agreement is that the Entocytheridae are not parasitic on their crayfish hosts. With this in mind, the development of host specificity is hard to imagine. Whether or not this apparent specificity is related to the crayfish habitat or other factors is unknown, but at present some definite association between the genus *Ornithocythere* and the burrowing crayfish *C. d. diogenes* appears to exist. (Supported in part by NSF Grant GB-4719.)

(109)

Carbohydrates and Nitrogenous Compounds in the Inner Bark of Loblolly Pine: Influence of the Southern Pine Beetle and Associated Stain Fungi

JOHN D. HODGES AND STANLEY J. BARRAS,
Southern Forest Experiment Station

Inner bark contains at least 34 free amino acids, of which 20 appear in the protein fraction. Storage of cut bolts for two weeks at 75° F. and 60-70% relative humidity resulted in a marked decrease in free amino acids and non-reducing sugars and an increase in protein-bound amino acids. Infestation by the southern pine beetle (*Dendroctonus frontalis* Zimm.) and/or associated stain fungi caused an additional decrease in free amino acids, soluble N, reducing sugars, and non-reducing sugars, and an increase in protein amino acids, insoluble N, and total N. Reducing sugars apparently were utilized before non-reducing sugars by the stain fungi as a carbon source.

(57)

The Effect of Gibberellic Acid on Mycelial Growth and Toxin Formation in Isolates of *Ceratocystis ulmi*

MAGGIE P. HURD AND LAFAYETTE FREDERICK,
Atlanta University

Six isolates of *Ceratocystis ulmi*, varying in pathogenic capacity, have been cultured on media containing 10, 50, 100, 400 and 1000 ppm of gibberellic acid (GA) in order to determine the effect this growth regulator has on mycelial growth and toxin formation. Mycelial growth was determined in two ways. Data on radial mycelial growth were obtained by culturing isolates on a synthetic nutrient agar medium. Data on mycelial yield were determined as dry weight of mycelium and were obtained by growing isolates in shake culture in a liquid nutrient medium. Some evidence of a stimulatory growth response was exhibited by some isolates at GA concentrations of 10 and 50 ppm. Mycelial growth of all isolates were inhibited at the higher GA concentrations.

Filtrates from shake cultures sterilized by filtration, were assayed for toxin titres. Titres were determined as the extent of wilting induced in 4 to 5 week-old tomato cuttings by culture filtrates. Filtrates from isolates cultured at 10 and 100 ppm of GA generally induced high wilting percentages. Filtrates from isolates cultured at 400 and 1000 ppm of GA induced low wilting percentages. The highest reduction in toxin titre were found in filtrates from isolates classed as moderately pathogenic.

(182)

A Study of Allometric Growth in *Pseudemys concinna suwanniensis* Carr (Order: Testudinata)

CRAWFORD G. JACKSON, JR.,
Mississippi State College for Women

A biometrical study of allometry in the Suwannee terrapin was made of the natural population of Fannin Spring in north-central Florida. Between November, 1960, and November, 1967, 230 randomly-collected individuals were measured, marked, and released. Separate records for each individual were kept, and consisted of 6 linear measurements: carapace length, carapace width, plastron length, anterior plastron width, posterior plastron width, and width of bridge. During the 7-year period of investigation, 140 individuals (61%) were recaptured from 1 to 12 times. From original measurements and those obtained at subsequent recaptures, relative and absolute growth rate analyses were made with respect to size and sex. With the data available from 62 males and 57 females, rate of increase of carapace length is greater in females ($K_g = .189$ versus $K_g = .170$) as is the absolute rate of the 5 other linear shell measurements analyzed. Anterior plastron width, posterior plastron width, and bridge width exhibit isometric growth with respect to carapace length in females. The greatest sexual difference in relative growth occurs in the rate of increase of bridge width, while the least sexual difference occurs in the rate of increase of plastron length. (Supported in part by a Sigma Xi-ReSA Grant-in-Aid.)

(125)

Marine Commensal Bivalve Mollusks from North Carolina

CHARLES E. JENNER AND ANNE B. MCCRARY,
*University of North Carolina, Chapel Hill, and
Wrightsville Marine Bio-Medical Laboratory, Wilmington*

Recent studies on the coast of North Carolina at Wrightsville Beach have revealed an exceedingly interesting, but almost completely unknown, faunal element involving species of bivalve mollusks living commensally with various invertebrates. Seven species have been recorded from the following hosts: a sea cucumber (*Leptosynapta inherens* (O. F. Muller), brittle stars, a capitellid annelid (two species), a polynoid annelid, *Squilla impusa* Say, and an echiurid worm. All of the above species of clams except the species associated with the last host listed belong to the Superfamily Erycinacea. Many of these show remarkable morphological modifications associated with commensalism. Their structure and biology will be described, including an account of the extreme degree of sexual dimorphism in *Montacuta percompressa* Dall (commensal on *L. inherens*). In this species the males are dwarf and degenerate and occur as parasites in the mantle tissue of the female. This phenomenon has not been reported previously in bivalve mollusks.

(7)

Sodium and Magnesium Interactions in Cotton Nutrition

H. E. JOHAM AND M. C. PAREKH,
Texas A & M University

Cotton plants were grown in nutrient solutions in which sodium and magnesium levels were varied. Boll weight was inversely related to sodium concentration. Increasing substrate magnesium tended to offset the adverse effects of high substrate sodium.

A variety effect was noted in relation to sodium tolerance. With Stoneville 7A, an increase in substrate sodium to 50 ml/l caused a 33% reduction in yield. When magnesium was added (20 ml/l) to the high substrate sodium level, the yield reduction amounted to 26%. In Acala 1517D the same treatments accounted for 81 and 53% yield reduction respectively. These results indicate that added substrate magnesium may partially reduce the effects of toxic sodium levels.

(6)

Effect of Sodium Substitution for Calcium on the Translocation of Carbohydrates in Excised Cotton Roots

LAMAR JOHANSON AND H. E. JOHAM,
Texas A & M University

Studies were conducted to determine the role of sodium in maintaining carbohydrate translocation (as measured by C^{14}) in excised cotton roots. In two different six-day experiments the following trend was observed. A $-Ca+Na$ medium led to significantly greater translocation of carbohydrate than a $-Ca-Na$ medium, but was significantly less than in the $+Ca+Na$ medium. Since the radioactive sucrose was supplied only to the distal portion of the excised roots, little carbohydrate was absorbed and growth was curtailed. The rate of respiration and RQ values of the roots were independent of nutrient treatment. Visual observations indicated that the roots were flaccid in the absence of sodium, but they were quite turgid when sodium was present. These studies support the conclusion that there is a direct sodium effect on translocation of carbohydrates.

(114)

Changes of Carotenoids and Lipoxidase Activity in Peanuts During Maturation and Curing

ELIZABETH B. JOHNS, H. E. PATTEE, AND A. E. PURCELL,
North Carolina State University and ARS, USDA

The effects of maturation and curing on the carotenoid concentration, color, and quantity of extracted oil, and on lipoxidase activity have been studied. The carotenoid level in the peanut kernel increased through the seventh week from pegging and then remained nearly constant. The percent oil showed a linear increase throughout maturation. The carotenoid concentration in the extracted oil, however, showed a very rapid reduction to the tenth week and a subdued rate of reduction from then to maturity at twelve weeks. A slow curing rate was also demonstrated to reduce significantly the carotenoid concentration of the oil. A lipoxidase system capable of decolorizing carotenoids was demonstrated and the activity was shown to increase rapidly with maturity. Comparison of activity from uncured and cured peanuts showed the cured peanuts to have a significantly higher level.

(86)

Comparative Physiology of Bovine and Porcine Spermatozoa

CLYDE EDGAR JOHNSON, JR., *Clark College*

This work describes the results of studies which determined the effects of anions on bull and boar sperm, under the influence of various cationic carriers, buffer systems, substrate levels, and temperatures. It was demonstrated that the nitrate ion enhanced motility, oxygen uptake, carbohydrate uptake and lactate production in bull sperm. The " NO_3 effect" was modified by the cationic carrier and abolished by lower temperatures and

the absence of extracellular substrate. Nitrate and chloride ions not only influenced the magnitude of bull sperm metabolism, but the metabolic pattern of metabolism as well. Chloride ions appeared to favor respiration, the NO_3 ion effected a more equal utilization of the glycolytic and respiratory pathways. The " NO_3 effect" could not be demonstrated with boar sperm. The O_2 uptake of boar sperm in nitrate and chloride was the same. Glucose uptake and lactate production by boar sperm appeared to be increased in chloride.

(89)

Hemolysis as a Cause of Green Tissues Among Neotropical Frogs

DUVALL A. JONES, *Carnegie-Mellon University*

High concentrations of biliverdin have been found in tissues and body fluids of some species of Neotropical frogs and tadpoles. The cause of this green pigmentation is unknown, but evidence indicates that hemoglobin from hemolyzed red blood cells may be the source of biliverdin. Accumulation of the green pigment appears to be due to defective excretion by the liver. High environmental temperatures and hormonal effects are suggested as hemolytic factors; these agents may affect liver function also. (Supported in part by a Sigma-Xi - ReSA Grant-in-Aid and by Grant GB-3644 from the National Science Foundation.)

(13)

Tracer Studies with Three ^{14}C -labeled Herbicides, DMSO and Tween 80 in Black Valentine Bean

D. W. JONES AND C. L. FOY,
Virginia Polytechnic Institute, Blacksburg, Virginia

Primary leaves of 21-day old beans (*Phaseolus vulgaris* L.) were treated with ^{14}C -labeled dimethylsulfoxide (DMSO), 2-methoxy-3,6-dichlorobenzoic acid (dicamba), 1,1'-dimethyl-4,4'-bipyridinium salt) and 2-chloro-4-ethylamino-6-isopropylamino-s-triazine (atrazine). Each herbicide was tested alone and in combination with 0.5% Tween 80 (nonionic surfactant containing polyoxyethylene sorbitan monooleate), 30% DMSO or both. DMSO at concentrations of 25% or more caused varying degrees of acute toxicity. However, radioactive carbon was generally distributed throughout the plant 5 days after application of DMSO- ^{14}C , as determined by autoradiography and counting. Tween 80 enhanced whereas DMSO apparently reduced the absorption and translocation of dicamba, a phloem-mobile herbicide. Neither Tween 80 nor DMSO markedly affected the movement of paraquat, which is usually regarded as a contact toxicant. Both Tween 80 and DMSO enhanced the foliar uptake and (apoplastic) movement of atrazine within the treated leaves.

(85)

The Conversion of Radioactive 17β -Estradiol to Urinary 2-Hydroxyestrone by Euthyroid, Hypo-, and Hyperthyroid Hamsters

WILLIAM B. KEITH AND KENNETH I. H. WILLIAMS,
The Worcester Foundation for Experimental Biology

The *in vivo* conversion of radioactive 17β -estradiol to 2-hydroxyestrone by the female Golden Hamster has been shown to be under thyroid control. Hypothyroid animals (thyroidectomized and thyroid inhibited) converted significantly less radioactive 17β -estradiol to Ketodase hydrolyzable urinary 2-hydroxyestrone than did control animals. Conversion percentages of 17β -estradiol in hyperthyroid females, and in three classes of thyroid conditioned male hamsters are also reported.

(49)

Flagellar Retraction in Posteriorly Uniflagellate Fungi

WILLIAM J. KOCH, *University of North Carolina, Chapel Hill*

Presented are observations of 17 species in the following 14 genera. BLASTOCLADIALES: *Allomyces* and *Blastocladiella*. CHYTRIDIALES: *Asterophlyctis*, *Catenochytridium*, *Chytridium*, *Chytriomyces*, *Cladochytrium*, *Entophlyctis*, *Phlyctochytrium*, *Rhizophlyctis*, *Rozella*, *Septochytrium*, and 2 undescribed cladochytriaceous genera. Recognized and described are four basic methods of flagellar retraction: *lash-around*, *body-twist*, *straight-in*, and *vesicular*. Variations in and combinations of the four basic methods are described. Observations with brightfield, darkfield, phase-contrast, and electron microscopy, along with what is known from the literature, are discussed and serve as the basis for generalized, summary diagrams or two dimensional models of patterns of flagellar retraction in posteriorly uniflagellate fungi. An endeavor is made to put the findings reported on in this paper in historical, morphogenetic, and phylogenetic perspective.

(149)

Studies on the Biology of *Proterometra albacauda*, Anderson and Anderson, 1967, an Azygiid Trematode

WAYNE A. KRISSENGER AND KRISHNA N. MEHRA, *Georgia Southern College*

Pleurocera laqueata (Say), a common river snail of Georgia, Kentucky, and Tennessee, was collected from Magnolia Springs, Millen, Georgia. They were found to shed cercariae of furcocystocercous type. The morphology of the cercaria was studied. The cercariae were forced fed to *Rana pipiens pipiens*, *Rana catesbeiana*, and *Bufo terrestris*. Adult parasites were recovered from the esophagus and stomach of these amphibians and were identified as *Proterometra albacauda*. The fishes *Lepomis macrochirus macrochirus* and *L. punctatus punctatus* were infected by dropping cercariae in their aquaria. The fish were observed to swallow the cercariae in a few minutes. Both species of fish were found to have this trematode in the esophagus and the stomach. *L. m. macrochirus* and *L. p. punctatus* were caught from the same site from which snails were collected. They were found to harbor adults of this trematode in the esophagus and stomach.

Pleurocera laqueata (Say) is reported as a new intermediate host and *Lepomis punctatus punctatus* is reported as a new host for this parasite.

(Supported by grant-in-aid from the Research Fund of Georgia Southern College.)

(87)

Ventromedial Hypothalamic Lesions and Their Effects on Fat Deposition and Other Physiological Phenomena in Migratory Birds

WAYNE J. KUENZEL, *University of Georgia*

There currently exists three methods by which birds can be induced to rapidly store up fat:

1) By manipulating the photoperiod (A. Wolfson, *J. Exp. Zool.* 125, 353-376, 1954; D. Farner *In* A. Wolfson (ed), Recent studies in avian biology, Univ. Illinois Press, Urbana, 1955);

2) By injecting hormones (D. Farner, *Gen. Comp. Endocrinol.* 4, 584-595, 1964; A. Meier and K. Davis, *Gen. Comp. Endocrinol.* 8, 110-114, 1967);

3) By lesioning the ventromedial hypothalamic area of the brain (W. Kuenzel and C. Helms, *BioSci.* 17, 395-396, 1967).

Employing the last method, we have observed that the fattening response in lesioned birds is quite similar to the naturally occurring response during the spring. It is our opinion that the control of fattening in migratory birds is effected by photic information eventually activating particular diencephalic regions, regulating feeding behavior, within the avian brain.

(5)

Dual Mechanisms of Phosphorus Uptake in *Euglena gracilis* Klebs

PHILIP A. LAHAYE AND JAMES G. GOSSELINK, *Louisiana State University*

The rate of absorption of phosphorus has been studied in *Euglena gracilis*. Two transport mechanisms for phosphorus have been suggested in the light of the kinetic data obtained. Mechanism₁ is active in a concentration range of 0.2-2.0 mg./100 ml. K₂HPO₄ and mechanism₂ at a concentration range 10-fold higher (2.0-20.0 mg./100 ml.). Higher concentration ranges tested gave results indicative of passive uptake.

(35)

The Moss Flora of Georgia: Interesting Species Which Have Been Found in the State

ROBERT K. LAMPTON, *West Georgia College*

Intensive collecting activities and researches into the Bryoflora of the State of Georgia have turned up species of mosses growing therein which are unusual in that the range of the species concerned has been extended considerably beyond the previously known geographical distribution. *Merceya ligulata* (Spruce) Schimp., one of the so-called "copper mosses" is abundant in Stewart County and *Cryptaea ravenellii* Aust. has been collected in at least three widely scattered counties. Other species thought to have a limited distribution in the southeastern states are expected to be found growing in Georgia. Information about habitats and distribution of these species is discussed as well as the status of Bryology in the State of Georgia.

(28)

Analysis of Polyethylene Glycol in Plant Material and its Absorption by Corn (*Zea mays* L. Gramineae), Bean (*Phaseolus vulgaris* L.; Papilionaceae) and Cotton (*Gossypium hirsutum* L.; Malvaceae)

DAVID W. LAWLOR, *Duke University*

The increasing use of Polyethylene glycols to reduce the water potential of the rooting medium of plants grown hydroponically, requires study on absorption of the polymer and possible adverse effects upon growth. Analysis was performed by a turbidimetric method (Hyden, S., 1956. *Kungl. Lantbraks Hogskolans Annaler* 22 139-145), which was found to be sensitive and simple to perform. Complete recovery of Polyethylene glycol was not achieved by water extraction of cotton and yellow poplar leaves and attempts to extract it are described and reasons for incomplete recovery discussed. Intact plants absorbed little Polyethylene glycol when grown for up to two weeks in concentrated solutions. Cutting the root system led to increased absorption and the effects upon plant-water potential and transpiration are considered. It is suggested that Polyethylene glycol blocks the pathways of water movement in the leaf.

(27)

Oleoresin Exudation Pressure and Relative Water Content of Inner Bark as Indicators of Moisture Stress in Loblolly Pine

PETER L. LORIO, JR. AND JOHN D. HODGES,
Southern Forest Experiment Station

Diurnal patterns of oleoresin exudation pressure (OEP) of 40-year-old loblolly pine (*Pinus taeda* L.) were related to changes in soil and atmospheric moisture. Single, early-morning measurements were not closely related to soil moisture stress. Relative water content (RWC) of inner bark reflected soil moisture status and diameter growth response, and apparently was affected by atmospheric moisture deficit. Trees continuously flooded eventually showed the most severe reduction in OEP and RWC. Daily average OEP was related to microsite differences during a severe fall drought. Trees on flat, usually wet sites lost significantly more pressure than those on low (0.3 to 0.6 meter) mounds. This response was attributed to a deficient fine-root system on flat sites.

(113)

Studies on Respiration of Pine Pollen

KAREN B. LUQUIRE, LINDA B. EDWARDS, AND
RAYMOND W. HOLTON, *University of Tennessee*

Pollen can metabolize exogenously supplied sugars. We have examined the effects of sucrose, glucose, fructose, and mannose on the respiratory rate of pollen of *Pinus virginiana* Mill. Although sucrose, glucose and fructose stimulate the rate over a phosphate buffer control, mannose significantly inhibits respiration and pollen tube development. Experiments in which various concentrations of sugars and pairs of sugar have been used do not suggest that the mannose inhibition is by a simple competition mechanism. Essentially no differences in response to the sugars were noted for pollen collected in the spring of 1966 or spring of 1967 and stored at low temperature and humidity since collection. We have observed that a gas is evolved immediately after the pollen is wetted, either under anaerobic or aerobic conditions. The gas is not carbon dioxide and efforts are being made to identify it and to understand its significance, if any, in pollen respiration and germination.

(21)

Studies on Glutamic Acid Decarboxylase from *Cucurbita pepo* L. cv Summer Crookneck

BRENA LEE MACKEY AND AUBREY W. NAYLOR,
Duke University

Crude glutamic decarboxylase preparations derived from squash appear to be specific for glutamic acid and require pyridoxal phosphate as a coenzyme. The prosthetic group is held tenaciously against dialysis. The pH optimum for squash glutamic acid decarboxylase is narrow and activity is irreversibly lost if the pH deviates appreciably from 5.7. In the lyophilized condition the enzyme is quite stable, but much activity is lost after a few hours in solution regardless of efforts to preserve it. Our most highly purified glutamic acid decarboxylase preparation was obtained by employing a heat step, fractional ammonium sulfate precipitation and alumina gel and calcium phosphate gel adsorption. A 48-fold increase in specific activity over the starting homogenate with a 22 percent yield of the original activity was achieved. From its pH optimum, stability on dialysis, behavior on Sephadex columns and half-life in solution it is concluded that squash glutamic decarboxylase is distinctly different from that found in bacteria and animals.

(183)

Photoperiod Acclimation of High Temperature Tolerance in Tropical and Temperate Frogs

JOSEPH J. MAHONEY, JR., *University of Georgia*

Goldfish, Crucian carp, and painted turtles are known to have greater thermal tolerance when acclimated to long photoperiods. It has been suggested that such photoperiod acclimation may be adaptive in "preacclimating" temperate zone animals for the longer, hotter days of summer. This report presents a comparison of the effect of photoperiod acclimation on the thermal tolerance of a tropical frog and a temperate frog. *Rana pipiens*, the temperate frog, when acclimatized to LD 8:16 (photoperiod regimes of eight hours of light alternating with sixteen hours of darkness), LD 12:12, and LD 16:8 at both 15° C and 25° C, had greatest thermal tolerance at the longest photoperiod. However, *Hyla labialis*, the tropical species, had greatest thermal tolerance at 25° C when acclimated to its natural tropical photoperiod. At 15° C thermal tolerance was lowest at LD 12:12, which may reflect an increased tolerance to cold.

(70)

The Apparent Cultural Eutrophication of Mountain Lake, Virginia

FREDERICK C. MARLAND, *University of Georgia*, and
STUART E. NEFF, *Virginia Polytechnic Institute*

Phytoplankton records of the Mountain Lake Biological Station provide evidence that Mountain Lake has become slightly more eutrophic in a 30-year period. Phytoplankton quotients have doubled between 1930 and 1960. An increase of the CaCO₃ alkalinity has also occurred. These effects are thought to have been caused by the enrichment from 6 hotel cottages and disturbances in the drainage basin due to the construction of the present hotel in 1936.

(142)

Carbohydrates in Adult and Larval *Proteocephalus ambloplitis* (Cestoda: Proteocephala: Proteocephalidae) from the Small Mouth Bass, *Micropterus dolomieu*

MARIETTA MARRA AND GERALD WISLER ESCH,
Wake Forest University

Adult and larval *Proteocephalus ambloplitis* were collected during the summer of 1967 from netted small mouth bass, *Micropterus dolomieu*. Comparative histochemical distribution of glycogen between adult and larval cestodes was determined by the periodic acid-Schiff (PAS) reaction. In addition, chemical analyses for glycogen, free tissue carbohydrate, and free tissue glucose were conducted. Results will be discussed.

(42)

A Study of *Isoetes* Common to the Granite Outcrops of the Southeastern Piedmont

J. F. MATTHEWS, *University of North Carolina at Charlotte*, and W. H. MURDY, *Emory University*

Populations of *Isoetes* representing two species, *I. melanospora* and *I. piedmontana*, were collected from thirteen granite outcrop communities in Alabama, Georgia, and South Carolina. The populations were grown under uniform water and light conditions until the plants were matured. Morphological characters, traditionally used to separate the species occurring on the outcrops, were analyzed. When the population variability of the characters was determined, the populations could be ar-

ranged so that the characters formed a cline, from those associated with one species to those of the other species. This intergradation of morphological characters seemed to coincide with the occurrence of intermediate habitats, where in one case, the morphological characters of the population graded from one species to the other. It was not determined whether the primary control over these characters was genetic or environmental. Two-dimensional chromatographic studies of polyphenolic compounds and chromosome studies provided no further species specific data.

(175)

Stoneflies (Plecoptera) of Northwestern South Carolina

VON H. McCASKILL AND RUDOLPH PRINS,
Clemson University

Qualitative collections for adult and nymphal stoneflies were made in a total of 116 streams over a one year period in Oconee, Pickens, Anderson, Greenville, and Abbeville counties. A total of 48 taxa was found. The distributions of 21 species of nymphs were ascertained; 13 species were generally distributed, six were found only above altitudes of 1000 feet, and two were found only below 1000 feet. The most abundant stoneflies within the study area were *Acroneuria abnormis*, *A. xanthenes*, and *Peltoperla* spp. Possible reasons for the decrease in density and diversity of stoneflies from higher to lower altitudes include changes in substrate types and water quality.

(185)

Upper Lethal Temperatures and the Distribution of Fresh Water Fish

ROBERT W. McCAULEY, *Waterloo Lutheran University*

A good correlation exists between upper lethal temperatures of fresh water fishes and the maximum summer temperatures of their habitat. For hardy species, however, temperature apparently plays a minor role in distribution since upper lethal temperatures often exceed maximum environmental temperatures by more than five centigrade degrees.

An explanation of this anomaly based on a study of the lethal temperature relations of the land-locked sea lamprey (*Petromyzon Marinus* L) throughout its life cycle, is suggested.

(139)

In Vitro Culture of *Drosophila* Wing Discs

EDWARD McCRADY, III, *University of North Carolina at Greensboro*

In vitro culture experiments on dorsal mesothoracic ("wing") discs of *Drosophila* have been carried out using the medium of Schneider (J.E.Z. 156, 1964) supplemented with fetal calf serum (Grand Island Biological) at a final concentration of 10%. After each culture period, disc tissue was transplanted into mature third instar larvae and allowed to differentiate during the metamorphosis of the host. By varying the period of *in vitro* culture from 0 to 14 days, it was determined that the thoracic and wing forming portions of the disc respond differently to the growth hormone of the larval host. The thoracic areas tended to lose their developmental capacities within one week, the average number of macrochaetae developed declining from 10 to 1.5. Such macrochaetae also decline in average length. The wing area of the disc, however, developed very poorly if transplanted without *in vitro* culture into a larva.

After three or more days of *in vitro* culture, wing area development appears normal following transplantation. It thus appears that a relationship exists between the two areas which affects developmental capacity following *in vitro* culture.

(45)

Fruiting Myxobacteria from the North Carolina Seacoast

JAMES C. McDONALD, *Wake Forest University*

Tree bark and soil samples from the beaches and inland coastal areas of the 11 North Carolina counties bordering the Atlantic Ocean were collected during the summers of 1964 through 1967 and examined for fruiting myxobacteria. Existing methods of isolation were used. Sixty samples of bark from 15 tree species and 133 soil samples were studied. Myxobacteria found on tree bark included *Archangium gephyra*, *Archangium primigenium*, *Archangium* sp., *Chondromyces catenulatus*, *Chondromyces medius*, *Podangium gracilipes*, *Podangium lichenicolum*, *Stelangium muscorum*, and *Stelangium vitreum*. Myxobacteria found in soil from beach areas (low tide mark to 10 yds. beyond high tide) included *Archangium gephyra*, *Chondrococcus coraloides*, *Myxococcus fulvus*, *Myxococcus xanthus*, *Polyangium cellulosum* var. *ferrugineum*, *Polyangium fuscum*, *Polyangium minus*, and *Polyangium* sp. From inland areas myxobacteria found were *Archangium flavum*, *Archangium gephyra*, *Chondrococcus* sp., *Chondromyces apiculatus*, *Myxococcus fulvus*, *Myxococcus stipitatus*, *Myxococcus xanthus*, *Polyangium cellulosum* var. *ferrugineum*, *P. cellulosum* var. *fuscum*, *Polyangium fuscum*, and *Sorangium nigrum*. Measurement of soil pH and organic matter content was made for each soil sample. The pH of each tree bark sample was determined. Several correlations were noted. (This study was supported by NSF grant GB-1814.)

(12)

Anomalous Responses of Young Tomato (*Lycopersicon esculentum*, var. Marglobe) Leaves to Phytokinin Treatment

JANIECE S. McHALE AND LEWIS D. DOVE,
Tulane University

Tomato plants were grown in a chamber under 2000 ft-candles illumination. Leaves were detached, treated, then placed in humid chambers under 50 ft-candles illumination. Ribonuclease (RNase) activity was assayed periodically during 8 days. Increased RNase activity was recently correlated with other indicators of senescence.

N⁶-benzyladenine immediately suppressed RNase increases in older leaves. RNase activity of younger leaves continued to increase following a single N⁶-benzyladenine treatment, but reached a plateau which the untreated controls finally exceeded. Kinetin-treated young leaves were initially induced to higher RNase activity than controls, but after several days controls surpassed the activity of treated tissue which failed to increase further. Response of detached leaves to phytokinins may be determined by age-related amounts of endogenous phyto-kinins. Water stress prior to detachment induced young leaves to respond like older leaves to phytokinin treatment. (Supported by P.H.S. Grant No. 5TI-GM-669.)

(26)

The Effect of Temperature and Moisture on Flowering and Boll Development in *Gossypium hirsutum* L. (Cotton)

BOBBIE L. MCMICHAEL AND ROBERT D. POWELL,
Texas A & M University

Plants of *Gossypium hirsutum* L. var. Paymaster 101A, (cotton) at three growth stages were placed in three controlled environment chambers. Moisture stress was induced at four different levels by the addition of Carbowax 6,000 to the nutrient solution in which the plants were grown. The environment chambers were maintained at different temperatures for the duration of the experiment. The number of squares, number of flowers, boll retention, boll period, seeds per lock, and boll development were measured. These factors were related to the development and yield of the plants under the various conditions studied. Yields were greatly affected by both temperature and moisture and stage of growth of the plants at the time of treatment. The lowest temperature used was the detrimental to the plants under all conditions. The addition of Carbowax to the nutrient solutions reduced water uptake and caused a direct desiccation of the leaves.

(59)

Causes of Endemism in *Visuiera porteri*

A. CLAIR MELLINGER, *University of North Carolina*

Visuiera porteri is a fall flowering composite endemic to island and ecotone communities on granite rock outcrops of the piedmont in Georgia and eastern Alabama. Observations of natural field populations and additional populations transplanted to outcrops in North Carolina led to the hypothesis that endemism is strongly controlled by germination requirements. In order to test this hypothesis experiments were conducted to determine the effects of various microenvironmental factors upon seed germination. Optimal and limiting values for temperature, moisture, light, pH, and interactions of these factors were the main considerations of this study. Optimal conditions for germination were then compared with the microenvironmental conditions of the species niche on the outcrop to identify a cause-effect relationship.

(174)

The Species and the Distribution of Quohog Clams (*Mercenaria*)

R. W. MENZEL, *Florida State University*

Two species of quohog clams, the northern *Mercenaria mercenaria* and the southern *M. campechiensis*, along with several recognized subspecies occur along the Atlantic and Gulf Coast of the United States. The northern quohog extends northward to Canada and is represented in the Gulf by the subspecies *M. m. texana*. This species is confined to the inshore waters of bays, inlets and estuaries of the proper salinity. The southern species occurs only offshore in the more northern part of its range (up to New Jersey) but occurs inshore south of Cape Canaveral and in the Gulf of Mexico area as well as offshore. The subspecies *M. m. texana* has been found inshore south of Cape Canaveral along with the typical northern and southern forms. The two species hybridize readily in the laboratory and the F_2 's have been reared. The morphology of the F_2 's is very similar to the subspecies *M. m. texana* and it is surmised that this subspecies is a naturally occurring hybrid.

(68)

Seasonal Fluctuation of Phytoplankton Composition and Production in a Freshwater Lake

KENNETH A. MEYER, *University of North Carolina at Chapel Hill*

Construction of an eight acre lake in the North Carolina Botanical Garden in the summer of 1966 provided opportunities for research in freshwater ecology. Seasonal variation in phytoplankton composition, distribution and production has been compared with climatic and chemical variables in an attempt to describe the probable complex of controlling factors that govern algal succession. Results of this study provide base-lines for several autecological and ecosystem studies which have been recently initiated.

(141)

A Histological Study of the Gastric Cardiac Gland in the Beaver (*Castor Canadensis*)

WILLIAM R. MILLARD AND IOLA T. MCCLURKIN,
University of Mississippi

At the right of the esophagus of the beaver (*Castor canadensis*), at the lesser curvature of the stomach, is an unusual cardio-gastric gland composed of numerous branched follicles. The secreting units of the follicles are tubular glands arranged at right angles to the follicular lumen. There are three regional segments recognizable per gland unit. The neck region comprises the upper tenth of the gland unit and is composed of mucin secreting simple columnar cells. The medial duct region is composed of simple cuboidal duct cells and parietal cells. The basal secretory region contains enzyme secreting zymogenic cells, mucous cells, and parietal cells.

The gland as a whole is composed of several layers: an inner glandular layer, lamina propria, muscularis mucosa, submucosa, muscularis externa, and tunica adventitia.

The gland possesses an elaborate blood system, and the direction of the flow of the blood within the follicles is indicative of a heightened secretory activity.

(188)

The Influence of Season on the Radiation Sensitivity of an Old Field Community

GARY L. MILLER, *University of North Carolina*

Recent radiation experiments have raised the question of how a natural system would respond if it were exposed to ionizing radiation at different seasons in the year. In other words, would nature express a seasonal differential in radiosensitivity?

In order to answer this question, four segments of an old field were seasonally irradiated (April, July, October, January) for 29 days using a portable 9200 curie ^{137}Cs source. Field studies included estimations of changes in population densities, plant growth and changes in reproductive potentials. The results of this study indicate a seasonal differential in radiosensitivity, with the winter phase of the community being somewhat more tolerant.

(93)

Electrophoretic Analysis of the Molt-Inhibiting Hormone in Crawfish

WILLIAM C. MOBBERLY,
Northeast Louisiana State College

The object of this investigation was to determine the electrophoretic behavior of the molt-inhibiting hormone (MIH) from the eyestalks of the crawfish *Faxonella clypeata*. Extracts prepared from 20 eyestalks were applied to a three centimeter wide filter paper strip and subjected to electrophoresis for 18 hours at one of the following pH values: 4.2, 7.2, and 8.4. At the end of the 18 hours the filter paper strip was cut into six one-centimeter sections on both sides of the origin. The sections were washed in physiological saline which was injected into eyestalkless crayfish. If MIH had been on the particular section of filter paper, then the incidence of molting would have decreased when the saline wash of that section was injected. The results showed that at each pH used MIH migrated toward the cathode. MIH is electropositive in the pH range 4.2-8.4.

(112)

Biochemical Changes in Immature Peanuts in Response to Curing Temperature

S. C. MOHAPATRA AND H. E. PATTEE,
North Carolina State University and ARS, USDA

Photosynthetically labelled peanut kernels were used to study the time-temperature-moisture relationship of biochemical changes occurring during curing of immature peanuts. Radioactivity of the lipid fraction increased during the first six hours of curing at 50° C and during the first twelve hours at 20° C. During subsequent hours of curing, the radioactivity decreased from 7.5×10^5 dpm/gm dry wt. at 50° C and 5.5 dpm/gm dry wt. at 20° C until it reached a nearly constant level of one-half the maximum values: 48 hours was required to reach the constant level at 20° C while only 24 hours was required at 50° C. Radioactivity in the ethanol-soluble fraction decreased during the initial period of curing and then increased slightly until a constant level was reached. This effect was more evident at 20° C than at 50° C. Changes from anabolic to catabolic processes seem to be influenced by the moisture level of the peanut kernel.

(181)

Variation of Pelage Color in Species of Mice

CLIFTON H. MOORE, RONALD BLESSING AND
MICHAEL H. SMITH, Savannah River Ecology Laboratory

This paper introduces the use of a new technique for measuring the pelage color in mammals. Reflectivity of the pelages from six species of mice (*Ochrotomys nuttalli*, *Peromyscus gossypinus*, *Peromyscus polionotus*, *Sigmodon hispidus*, *Neotoma floridana* and *Mus musculus*) was measured by the Baush and Lomb Spectronic 505 Spectrophotometer. Two treatments were evaluated: (1) pelages pressed against glass showed an increased reflectivity at all wavelengths when compared to (2) pelages without glass pressed against the hair. Significant linear relationships were observed between wavelength (X) and per cent reflectance (Y) for each species and each individual within a species regardless of treatment. However, a non-linear model represented by $Y = a + b_1X + b_2X^2 + b_3X^3$ accounted for significantly more of the variability than a linear model for treatment 1.

(88)

Studies on the Metastasis of the Fortner Plasmacytoma to the Brain and Other Tissues of Hamsters

JACK H. MOORE, DANIEL P. GRISWOLD, JR.,
CHARLES A. KELLEY, AND DONALD J. DYKES,
Southern Research Institute

The Fortner hamster Plasmacytoma No. 1 has been shown to possess features characteristic of many human malignancies — features which should be of advantage in attempting to better understand neoplastic growth and response to chemical agents. This tumor has been shown: to metastasize to the axillary lymph nodes by one day following subcutaneous implant of a tumor fragment and to the brain, spleen, liver, lungs, kidneys, blood, and femoral marrow as early as six days following subcutaneous implant; to proliferate in the brain and eventually result in host death; and to cause host death, following cyclophosphamide (Cytosan)-induced regression of subcutaneous tumors, by continued growth in sites (e.g. brain) which are relatively inaccessible to active Cytosan metabolites.

(11)

Stimulation of Ethylene Production and Abscission

PAGE W. MORGAN, Texas A & M University

Discovery of auxin-induced ethylene synthesis led to the proposal that materials which stimulate ethylene production can be used to control plant growth (Morgan, Proc. 1967 Beltwide Cotton Research Conf. pp. 151-155). An experimental chemical of Amchem Products, Inc., which produces effects parallel to those of ethylene, had been tested for its ability to modify growth of the cotton plant. Amchem 66-329 induced abscission of leaves and fruiting forms of cotton plants in the greenhouse and field. The time course of abscission due to ethylene and Amchem 66-329 was similar. The product stimulated ethylene production to peak concentrations ranging from 4 to 70 ppm in the air around enclosed, flowering plants. Ethylene production by treated plants reached levels which induced abscission in non-treated plants and stimulation preceded abscission. The apparent stimulation of abscission by ethylene produced from or by the Amchem 66-329 indicates that it may be possible to modify the numerous plant processes affected by exogenous ethylene with timely applications of ethylene substrates.

(116)

A Model for the Regulation of Hyphal Branching in the Water Molds

J. THOMAS MULLINS, University of Florida

The plant body of *Achlya* and other water molds consists of coenocytic hyphae, whose walls are composed of about 15% microfibrillar cellulose and 85% of an amorphous non-cellulosic polysaccharide complex. Branch formation by such a structure involves the problem of expanding a localized portion of the wall. It has been found that the induction of branching is always accompanied by a rise in the enzyme cellulase. It is suggested that wall-softening enzymes such as cellulase regulate the production of hyphal branching by the production of "weak spots" in the cell wall which then allows the hyphal contents to be flow-oriented in the direction of maximum strain into finger-like laterals.

(83)

Some Attributes of an Amphioxus
(*Branchiostoma caribaeum*) Population in
Old Tampa Bay, Florida (Leptocardii,
Amphioxii, Branchiostomidae)

GIDEON E. NELSON, *University of South Florida*

Branchiostoma caribaeum begins spawning in Old Tampa Bay during late August. Length frequency data are interpreted as showing three age classes: 1) Less than one year old: specimens under 25 mm in length, 2) Second year class: 25-45 mm, 3) Third year class: 45-60 mm. Sexual maturity begins at 30 mm in length.

(66)

Modern Carbonate Sediments: Algae and Marl
Sediments in Coastal Marshes, Everglades
National Park

STEVE A. NEUBERT, *University of Miami, Coral Gables*

The deposition of calcium carbonate by Cyanophyta (blue-green Algae) was studied with respect to changes in the bicarbonate, pH, and oxygen of the surface waters. The nature of these changes indicates that biogenic deposition of calcite is occurring by the active extraction of bicarbonate (HCO_3^-) ions in exchange for hydroxide (OH^-) ions. The physical precipitation of calcite by withdrawal of free carbon dioxide from solution would appear to account for an insignificant portion of the sediment. Estimation of the calcite formed was 19 lbs/acre/day. Comparison of water chemical data indicates a fundamental difference between this area and the main drainage system of the Everglades, and reflects the different type of marsh sediments accumulating in the two areas.

Future study of the area will include grain-size distribution of sediment and isotope fractionation of carbon and oxygen in the system.

(10)

The Reversal of Ethionine-Induced Inhibition of
Elongation of *Avena* Coleoptiles by
Various Compounds

W. E. NORRIS, JR., *Southwest Texas State College*

Ethionine-induced inhibition of elongation of *Avena* coleoptile segments has been measured in water and in indole-3-acetic acid. In the presence of 10 mM L-ethionine the inhibition amounts to about 70%. It has previously been shown that the addition of adenosine triphosphate effectively counteracts this inhibition; optimal ATP concentrations are between 0.25 and 0.5 mM. Adenine, adenine sulfate, adenosine, and guanine have now been shown to act similarly to ATP in reversing the ethionine-induced inhibition of elongation.

(147)

Nucleases of *Haematoloechus medioplexus*

D. A. NUNNALLY, B. J. BOGITSH, AND D. A. DAVIS,
Vanderbilt University

Ribonuclease and deoxyribonuclease were measured in low speed (15,000 x g, 15 min) supernatants of homogenates of the frog lung fluke, *Haematoloechus medioplexus*, employing standard procedures. Optimum pH for ribonuclease, using 0.1 M acetate or veronal-acetate buffers, is 7.2, although enzyme activity could be demonstrated over a wide range of pH values. For deoxyribonuclease, 0.2 M Tris-maleate buffers were used to

determine optimum pH, which proved to be 5.1. For this enzyme, there were indications of a second peak in the vicinity of pH 8; tentative hypothesis that this peak represents a second enzyme is supported by the fact that activity in the alkaline range is mildly stimulated by the presence of Mg^{++} in the incubating medium, while Mg^{++} is inhibitory below neutrality.

Both deoxyribonuclease and ribonuclease were localized in unfixed cryostat sections by the use of a substrate film method. For both enzymes, activity was prominently displayed in the lumen of the digestive tract and in the eggs. These enzymes are therefore interpreted as constituting part of the digestive apparatus of *H. medioplexus* as well as playing unspecific roles in embryonic development. (Supported, in part, by National Science Foundation Grant GB-4742.)

(120)

Using Colchicine to Determine the Number
of Cells Initially Forming a Lateral
Root Primordium¹

D. H. O'DELL,² D. E. FOARD, *Oak Ridge National
Laboratory and East Tennessee State University*

Colchicine has been used to prevent nuclear and cell division in seedlings without preventing lateral root initiation. In the lateral root primordia of these seedlings, pericyclic cells that normally would have divided replicate their chromosomes without nuclear division. Such cells thus become "tagged" by their polyploid restitution nuclei. Therefore it is possible to count directly from serial sections the number of parent-root pericyclic cells involved in the initial formation of a lateral root primordium. Thus far such counts have been made for three cereals: wheat, *Triticum aestivum* L.; rye, *Secale cereale* L.; and barley, *Hordeum vulgare* L. In each case the number of cells initially forming a lateral root primordium is about 16. This study is currently being extended to species in other groups.

¹ Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.

² Research Participant

(75)

Testing Pesticides at the Ecosystem Level

EUGENE P. ODUM, GARY W. BARRETT, AND
H. RONALD PULLIAM, *University of Georgia*

Problems sometimes arise when pesticides are tested at one level (i.e., individual or species) and then used without further study at another level (i.e., community and ecosystem). To determine the feasibility of field testing through the use of indices that measure effects on non-target as well as target components two experimental one-acre grain crop enclosures were established, one of which received single application 2 lb. Sevin insecticide in mid-summer. In addition to the expected sharp reduction in density phytophagous insects the following community-level indices were reduced by the treatment: litter decomposition, mammalian reproduction and arthropod equitability for 1-2 weeks; herbivore diversity 2-3 weeks; predator diversity and density 3-4 weeks; herbivore density and biomass for 6 weeks. Plant standing crop, net primary production, seed production, and terminal density small mammals were not affected. The cost of the "ecosystem test" was estimated to be less than would be required for a laboratory testing procedure for any one of the components.

(119)

Chilling Effect and Related Changes in *Hibiscus Esculentum* L. Plants

R. G. OMRAN AND ROBERT D. POWELL,
Texas A & M University

The effect of chilling on *Hibiscus esculentum* L. (Okra) plants has been determined. Okra, var. Green Velvet, at two growth stages was subjected to three temperature regimes at two humidities, in controlled environment rooms, and returned to the greenhouse after treatment. The treated plants were graded for the severity of injury and compared to controls. All plants treated a 5° C were injured and the young plants died after 6 days. Injury to the mature plants was a terminal "die back" which became more apparent with subsequent growth. Regrowth originated from the lower part of the stems. At 10° C, less damage occurred in plants at both ages than was evident at 5° C. After treatments at both temperatures plants showed a decline in the number of flowers when compared to the control. Cold also induced changes in dry weight and nitrogenous constituents.

(55)

Unrecorded or Otherwise Unusual *Vaucheria* from N.C.

DONALD WILLIAM OTT, *University of North Carolina*

Recent collections of *Vaucheria* from the piedmont and coastal regions of North Carolina have yielded material of more than half of the fifteen species reported for the state. In addition, several previously unrecorded species have been collected in both marine and fresh water habitats including: *Vaucheria discoidea* Taft, *V. sessilis* f. *clavata* (Vaucher) Heering, *V. walzi* Rothert, *V. nicholsii* Brown, and *V. thuretii* Woronin. Critical stages in the development of antheridia and oogonia have been observed in material in the laboratory for most species collected. Unusual variation in the morphology of the reproductive structures was encountered in a number of species, both in the laboratory and in nature, which suggest that some characters presently used for distinguishing species of *Vaucheria*, especially those placed in the section Corniculatae, may not be reliable.

(36)

Hybridization in the Genus *Melanthera* Rohr (Compositae)

JAMES C. PARKS, *Vanderbilt University*

The natural variability found in the genus *Melanthera* and the wide distribution of some taxa has lead to a great proliferation of synonyms and a persistent source of confusion for taxonomists. Cytological studies have revealed a uniform haploid chromosome number ($n = 15$) in all U.S. taxa. This work, supplemented by field and greenhouse studies, suggests that hybridization may readily occur in nature. Evidence for the hybrid origin of some naturally occurring forms will be presented. The importance of considering hybridization as a factor in delimiting the taxa of *Melanthera* will be discussed.

(78)

A Limnological Reconnaissance of the Eastern Prairies of the Okefenokee Swamp

FRED K. PARRISH AND FELICIA H. HOLLINGSWORTH,
Georgia State College

A study was made to determine the aquatic macro-invertebrates in the Okefenokee Swamp, to ascertain the range of certain environmental conditions, and, initially, to select proper techniques for measuring and for collecting in this specific situation. Data and organisms were collected at approximately five week intervals for eighteen months in four eastern prairies. The animals collected were: Oligochaeta - 359, Hirudinea - 1, Arachnida - 239, Cladocera - 440, Copepoda - 280, Decapoda - 4, Amphipoda - 1, Coleoptera - about 40, Diptera - 441 larvae, Ephemeroptera - 23 larvae, Hemiptera - about 90, Lepidoptera - 2 larvae, Trichoptera - 15 larvae, Odonata - 68 nymphs. These organisms are in the process of being identified. Collection was most effective with a combination of straining the water with a 40 mesh sieve, taking Eckman dredge samples, examining aquatic plants, and picking up insects as they were seen. Hand sorting with the aid of a dissection microscope was the best method of separating the animals from the plant material.

The results of chemical analyses of the water were: pH - 4.2 to 4.6, Secchi disc readings - 4 to 32 inches, dissolved oxygen - .25 to 8.5 p.p.m. (depending on depth and time of day or night), dissolved carbon dioxide - 12.5 to 39 p.p.m. (depending on time of day or night), total alkalinity - trace, and total hardness - about 30 p.p.m. These data are similar to those for lower coastal plain rivers in this region.

Appreciation is expressed to the U. S. Fish and Wildlife service, which granted special permission for these studies, and to the Okefenokee Wildlife Refuge personnel for cooperation and aid in sampling and collecting.

(105)

The Uptake and Metabolism of Trifluralin by Goldfish, *Carassius auratus* (Linn.)

JOHN H. PAXTON, *Clemson University*

The uptake and metabolism of sublethal doses of topically and orally administered trifluralin (2,6-Dinitro-N, N-di-n-propyl- α,α,α -trifluoro-p-toluidine) by *Carassius auratus* was studied. The heart, liver, brain, kidneys, stomach and intestines, gonads, edible portion, and feces were analyzed using thin-layer and gas-liquid chromatography after 48 hours of exposure to the material. Trifluralin was detected in all tissues analyzed except the brain. One metabolite, 2,6-Dinitro-N-n-propyl- α,α,α -trifluoro-p-toluidine was found in the stomach and intestines, edible portion, and feces in both topically and orally dosed fish at a level 15% of the trifluralin present. A second metabolite, 2,6-Dinitro-4-trifluoro-methyl aniline was found in the edible portion of the orally dosed fish but not in those topically dosed. The two metabolites by a N-dealkylating mechanism, site undetermined.

(129)

Ultrastructural Changes in the Life Cycle of *Crithidia fasciculata* (Zoomastigophorea, Kinetoplastida, Trypanosomatidae)

JEROME J. PAULIN AND WILLIAM B. COSGROVE,
University of Georgia

Heteroxenous trypanosomatid flagellates exhibit ultrastructural modifications of cellular organelles in their life cycle. Mitochondria, kinetoplasts, Golgi apparatus

and subpellicular microtubules are generally well-developed in the mid-gut or culture forms and poorly developed in blood-stream forms. We report here, in the monoxenous species *Crithidia fasciculata*, ultrastructural differences between individuals from young and old cultures.

Aliquots from axenically grown mass cultures of *C. fasciculata* were fixed every 6 hours over a 48-hour interval in buffered glutaraldehyde and/or osmium tetroxide. Examination of thin sections of log phase cells (i.e. 12-24 hours post inoculation) revealed well-developed mitochondria with numerous cristae. The kinetoplast, situated below the flagellar apparatus, was frequently observed to be an integral part of the mitochondrial complex. A well-developed Golgi apparatus and subpellicular microtubular system were present. Cells in the phase of declining growth rate (36-48 hours post-inoculation) were characterized by atypical mitochondria with irregular bulbous cristae and a general wrinkled appearance. The continuity between the kinetoplast and mitochondria was lacking or poorly differentiated. The cytoplasm contained conspicuous membranous fragments, suggesting the apparent breakdown of mitochondria or other cytoplasmic organelles, and electron-dense bodies which appear to be lipoidal in composition.

(198)

Remote Sensing for Plant Ecological Studies on a Watershed in Georgia

G. L. PLUMMER, *University of Georgia*

The Little River Watershed covers 150 sq mi of Coastal Plain land northwest of Tifton. Color-infrared photographs and thermal-infrared surveys were made to characterize distinguishable ecosystems at three different times of the year: winter, late-spring, mid-summer. Land-use patterns on the watershed at different times of the year shall be illustrated and described. "Normal" land-use characteristics shall be compared with typical deviations associated with different soil series from north to south. Various observations, measurements and interrelationships have been synthesized to establish a set of hypotheses whereby a model system may be programmed to analyze variations in environmental factors so that a basis may be established for predicting certain hydrological characteristics of crop-soil ecosystems elsewhere under similar conditions.

(148)

Incidence of Parasitism in Two Species of *Plethodon* (Amphibia: Plethodontidae) by *Brachycoelium* (Trematoda: Brachycoeliidae)

VERNON N. POWDERS, *Georgia Southwestern College*

During 1966 and 1967 the incidence of *Brachycoelium* infections in 392 *Plethodon glutinosus* and 988 *P. jordani* was studied. Both salamander species were collected in the Great Smoky Mountains National Park, Tennessee. For all areas and altitudes throughout the study, *P. glutinosus* was 17.85 per cent infected and *P. jordani* was 6.07 per cent infected. The per cent infection for *P. glutinosus* and *P. jordani* between the altitudes 2,700 and 4,600 feet (altitudinal levels where both species occur together) was respectively, 12.34 and 9.2. Above 4,600 feet, where only *P. jordani* was collected, some areas were found in which no *Brachycoelium* infections occurred. Comparisons of per cent infection between the two salamander species were made at various altitudinal levels and between seasons. It was concluded

that *Brachycoelium* infection rates are equal in *P. glutinosus* and *P. jordani* and that infection rates appear to be independent of altitude. It was also concluded that *Brachycoelium* infection rates remain fairly constant throughout the year.

(115)

Physiology of Hypocotyl Hook Opening

ROBERT D. POWELL AND PAGE W. MORGAN,
Texas A & M University

The photomorphogenic control of hypocotyl hook opening in the *Phaseolus vulgaris* (bean) and *Gossypium hirsutum* (cotton) seedling have been studied. Seedlings were grown in the dark, excised under safe green light and hook opening measured after 18 to 24 hours. With beans, opening is blocked in submerged hooks in the light, but begins as soon as they are removed from the water. The response of bean hooks is influenced by how they are positioned after they are cut. In the dark opening of standing hooks is greater than those lying horizontally and there is a geotropic component of the opening of horizontal hooks. The presence of cotyledons retards opening of bean hooks in both red light and dark. In contrast, under similar conditions, the cotton hypocotyl hook opens much more rapidly and completely when the cotyledons are present than when they are excised. Red light appears to have little effect on the opening of the excised cotton hook.

(155)

The Death of Classical Parasitology?

CHARLES E. PRICE, *Augusta College*

As a classical biologist, this author is alarmed at the ever-increasing tendency to relegate classical biology to the status of a minor or even unnecessary area of life science. While realizing the absolute necessity of the fields of experimental and/or molecular biology, the present author is one classical worker who is not yet prepared to "roll over and play dead".

This presentation consists of a reading (with comments) of a paper written by the author during 1967. The paper, entitled "Requiem for Classical Biologists?", was published in *Bios* (vol. 38, no. 2, pp. 85-88). The primary goal of "Requiem" was to have graduate students realize that the only enduring approach to the study of biology is the acquisition of a knowledge of both molecular and classical biology.

(40)

A Preliminary Report on the Vascular Flora of Mississippi

THOMAS M. PULLEN, *University of Mississippi*,
SAMUEL B. JONES, JR., *University of Georgia*, AND
J. RAY WATSON, JR., *Mississippi State University*

Approximately 40,000 collections were made between September, 1963 and November, 1967, in the 47,716 square mile area included in Mississippi. Distributional ranges have been extended beyond those previously published and over 200 new state records have been established. Although most species were typical of Coastal Plain and Piedmont vegetation, a number with more western or northern centers of distribution were uncovered. Plans call for a continuation of this study, leading ultimately to production of a manual of the Mississippi flora. (Supported, in part, by National Science Foundation Grant GB-4635.)

(138)

Hormones and PET Mouse Melanocytes

W. M. REAMS, JR., W. H. DORMAN AND
R. E. SHERVETTE,¹ *University of Richmond*

In the frog, both epidermal and dermal melanophores are stimulated by MSH; however, only dermal melanophores show pigment granule aggregation in response to melatonin and other hormones. In mammals, epidermal melanocytes have been shown to respond to MSH but are refractory to hormones which usually evoke color lightening in amphibians. In a broad series of tests, we have found that dermal melanocytes of the PET mouse are also refractory to melatonin, acetylcholine, epinephrine and norepinephrine.

¹ Present address: *University of Virginia*.

(170)

Megaspore Tetrad Patterns in Leguminosae

DAVID H. REMBERT, JR., *University of South Carolina*

A review of the literature and the work of this author reveals that at least 13 megaspore tetrad patterns may occur in Leguminosae. The majority of species investigated follow patterns which result in the development of a single functional megaspore. There are 6 species (*Lupinus luteus*, *L. polyphyllus*, *Lathyrus odoratus*, *Laburnum anagyroides*, *Wisteria sinensis*, and *Pueraria lobata*) that are reported to follow patterns which result in the development of 2 functional megaspores. All of these legume species have tetrad patterns that could have been derived from a generalized or hypothetical tetrad pattern. This ancestral pattern consists of 4 megaspores in linear arrangement with any one of the megaspores having an equal potential for development into a megagametophyte. The various megaspore patterns could have been derived by any one or a combination of the following conditions: loss of spore function, change in division plane, loss of cell wall, and loss of nuclear division. Based on these criteria a phylogeny for tetrad patterns may be suggested for Leguminosae.

(33)

Infrared Spectrophotometry: A Plant Taxonomic Tool Preliminary Investigation

JOHN D. REYNOLDS, *Richmond Professional Institute*

Cold chloroform leaf extracts of several plant species were subjected to Infrared Spectrophotometric analysis. Spectrographs were made of Diapensiaceae (*Shortia galacifolia* T. & G., *Galax aphylla* L., *Pyxidanthera barbulata* Michx. and *P. brevifolia* Wells), Compositae (*Liatris secunda* Ell., *L. graminifolia* (Walt.) Willd., *Vernonia noveboracensis* (L.) Michx., *V. altissima* Nutt., *V. angustifolia* Michx., *V. acaule* (Walt.) Gleason, hybrid of *V. angustifolia* x *V. acaule* and hybrid of *V. angustifolia* x *V. noveboracensis*) and *Spinacia* sp. Since in all cases crude extracts containing chlorophyll were used, generalized patterns appear to be similar for all plant families examined. A critical analysis of resonating frequencies showed enough differences to distinguish between species of the same genus. It was also possible to distinguish hybrids with this analysis. In all cases the hybrids showed a closer similarity to the spectrographic pattern of the female parent. No attempt has been made to identify any of the resonating groups.

Studies, to date, have been concerned simply with the possibility that Infrared Spectrophotometry may be used as a tool for "fingerprinting" species within a genus. The differences in the spectrographs of closely related species indicate the possibility of using this technique as an adjunct to morphological taxonomy.

(69)

A Comparison of Phytoplankton of Open Everglades and an Alligator Hole

PETER B. RHOADS AND ROBERT POPE,
University of Miami

Periodic quantitative plankton samples were taken from April thru July of 1965 and during the same period of 1966 at an alligator hole in Everglades National Park. Additional samples were collected in November of 1967. The majority of algal forms found in the alligator hole samples were also found in the open everglades. This implies that a part or all of the phytoplankton assemblage found in the alligator hole is carried in by the slow water flow from the neighboring shallow glades. The sparsity of plankton in the quantitative samples is readily apparent. Of the 23 genera of algae that were found, 17 genera or 74% of the total were Chlorophyceae, but most of these forms were present in trace numbers. It appears that the greater part of the algal primary productivity in the alligator hole-everglades area is due to the heavy periphyton growth. An exception to this situation occurred in April, 1965, when a plankton bloom was observed in the alligator hole. At this time the water table was below the surface of the everglades, and it is possible that the alligator hole was acting like a small pond rather than the usual shallow marsh.

(118)

Growth of the Oxygen Tolerant Strain of *Chlorella sorokiniana* at Hyperbaric Oxygen Pressures

B. RICHARDSON, F. W. WAGNER, AND B. E. WELCH,
USAF School of Aerospace Medicine,
Brooks Air Force Base, Texas

The growth rate of the oxygen tolerant strain (OTS) of *Chlorella sorokiniana* decreases in a linear fashion as the partial pressure of oxygen is increased from 711 to 1478 mm Hg. Under two atmospheres of oxygen growth ceases after 10 to 12 hours and is never resumed. This cessation of growth is not due to any permanent injury, and growth is resumed when oxygen partial pressure is reduced to one atmosphere or less. The inhibition occurs under both heterotrophic and autotrophic conditions and is not due to a stoppage of cell division alone. The results indicate that the tolerance of OTS cells to elevated oxygen pressures is not an absolute immunity, and that hyperbaric nitrogen partial pressures have a moderate inhibitory effect on the growth rate of *Chlorella*.

(161)

A Morphological and Cytochemical Study of *Hexamitus batrachorum* Swezy, 1915

LARRY D. RISINGER AND FELIX H. LAUTER,
University of South Carolina

In this study five staining procedures were employed. They included: Best's carmine stain for glycogen, Feul-

gen's nucleal stain for DNA, Heidenhain's hematoxylin stain, Bodian's method of silver impregnation (protargol), and the methyl green-pyronin Y stain for DNA and RNA. The methyl green-pyronin Y stain, Best's stain, and the Feulgen stain were used for the first time on *H. batrachorum*. The hematoxylin and silver protein stains had been used previously in other studies on *H. batrachorum*.

The specificity of the Feulgen stain and the methyl green-pyronin stain was confirmed by the use of DNase and RNase. Salivary amylase was used to confirm the specificity of Best's carmine stain for glycogen. Glycogen is demonstrated in the cytoplasm, while DNA is demonstrated in the nuclei. In addition both DNA and RNA are demonstrated in the two posterior organelles. A hypothesis, dealing with the identification of the two posterior organelles, is stated.

(48)

Experimental Taxonomy of Some Members of the Saprolegniaceae

BOSILJKA RISTANOVIC AND CHARLES E. MILLER,
Ohio University

From September, 1967, through January, 1968, approximately 100 strains of water molds (Saprolegniaceae) from several aquatic habitats from the environs of Athens, Ohio have been isolated, purified and studied taxonomically. Regular monthly collections, purifications and identifications have been made from Dow Lake, Southeastern Ohio, to determine seasonal influences on the number and kinds of water molds present. Sixty-six of these strains have been identified as various species of *Saprolegnia*, two as *Leptolegnia*, eight as *Achlya*, and one as *Aphanomyces*. Thirty-three strains of *Saprolegnia* did not produce oogonia and were not identified to the species level. Certain representatives of the identified strains have been grown on various kinds of media frequently used in classical bacteriological taxonomy. Initial results indicate that the growth responses by these fungi to some of the media may be useful as supplementary taxonomic characteristics in the identification of these taxa.

(72)

A Functional Classification of Forest Litter Arthropods Based Upon Response to Resource Enrichment

W. H. RITTENHOUSE, *University of North Carolina*

A study was made to separate the most common species of litter arthropods in the study area into functional groups based on response to enrichment of the habitat with presumed resources. Commercial sedge peat, partly decomposed leaves, and a mixture of partly decomposed leaves and peat were applied as resource treatments to study areas; and population parameters of seven species were followed for ten weeks by a sampling program. A summary of the results will be presented. This study was done as a search for possible competitive interactions, which will be discussed briefly.

(199)

Moisture Depletion Within Crop-Soil Sites

ROBERT H. RIVERS AND G. L. PLUMMER,
University of Georgia

Soil moisture conditions in early August 1967 were measured twice daily with a 241-Am-Be soil moisture probe to evaluate both depletion and recharge character-

istics under two soil series (759-Fuquay loamy sand; 758-Tifton sandy loam) and three crops (corn, cotton, peanuts) in the Coastal Plain region. Observations, measurements, and interrelationships were tested statistically. Unique soil-crop interactions occur on each site in such a way that every field may be distinguished with independent characteristics. When certain soil-moisture-depletion characteristics were used to evaluate crop behavior, each crop apparently used soil-water differently from the other; more water was lost under corn than under peanuts; cotton apparently withdrew the least amount of water. Tifton sandy loams were generally "wetter" soils than Fuquay loamy sands. Implications for other plant ecological studies shall be presented from results obtained during this study.

(20)

Changes with Plant Age in the Activities of Two Invertases of Louisiana Sugarcane

TAWAKOL Y. RIZK AND W. C. NORMAND,
Louisiana State University

The first stubble crop of three varieties of sugarcane C. P. 36-105, C. P. 42-10, and C. P. 48-103 grown under uniform agronomic practices was used for this study. Invertase activities were detected at pH 5.5 and pH 7.0 respectively from mature and immature internodes.

The activity of both invertases increased from the high-sucrose internodes (parts or varieties) to the low sucrose internodes. The increase of acid invertase activity was considerably larger than that of the neutral invertase among parts of the stalk as well as among varieties.

The activity of the two invertases tended to increase with plant age at different rates. The increase of acid invertase activity in partially mature cane was greater than that of the neutral invertase. When the cane became more mature and reached its highest sucrose content the neutral invertase activity increased faster than the acid invertase activity. These results showed a direct relationship between the two invertases in mature and immature internodes, and this relationship was influenced by the sucrose content.

(9)

Histological and Mitotic Changes in Excised Cotton Roots in Response to Trifluralin or Nitratin Treatments

TAWAKOL Y. RIZK AND W. C. NORMAND,
Louisiana State University

Two comparable concentrations of the two herbicides were studied for their effects on mitosis and other histological changes in excised cotton root tips, which grown under sterile conditions on a modified White's medium (Machlis and Torrey 1956). The length of the roots were determined daily for three days. Segments of the roots were taken after 24 and 72 hours for sectioning (cross and longitudinal sections) and staining according to Johansen techniques.

Both herbicides inhibited root growth at different rates and the rate of inhibition increased with time as well as the herbicide concentration. This gross effect was correlated to an inhibition of mitosis or elongation depending on time and the herbicide concentration. Several other effects of xylem differentiation, diameter of the stele the shape and size of both cortex and pith cells were observed and were related to treatment by the herbicides.

(111)

Effect of Wounding on the Composition of Slash Pine Oleoresin: A Preliminary Report

DONALD R. ROBERTS, *Southeastern Forest Experiment Station, Olustee, Florida*

Gas chromatographic analysis of slash pine (*Pinus elliottii* Engelm. var. *elliottii*) oleoresin revealed that wounding of the trees, as in a naval stores operation, greatly changed the terpene hydrocarbon composition of the oleoresin from above, but not below, the wounded area (face). Generally the percentage of alpha-pinene in the turpentine portion of the oleoresin decreased whereas beta-pinene and beta-phellandrene percentages increased. The effect of wounding on oleoresin composition was evident as much as ten feet above the wounded area.

Experiments with small wounds (micro-chips), designed to determine the rate of composition change, failed to detect large differences, but minor effects of wounding were evident after one week. Experiments using fullface wounds (streaks) will be continued to investigate more fully the rate of composition change.

(201)

Conservation of Plant Species

HOLLIS J. ROGERS, *University of North Carolina at Greensboro*

The rapid increase in the human population with the resulting pressure on the natural resources is endangering the survival of numerous species of native plants. Urban expansion, atmospheric pollution, highway construction, water storage, strip mining, airport extension, modern farming and herbicide application is resulting in a serious reduction of the native habitat of many plant species. The college students of the present generation who were required to turn in 50 to 100 plant specimens for high school biology may now be expected to submit one, two or three collections of similar size in order to complete their program in the biological sciences. They may then be certified to teach biology and may thereby require their students to search through the ruins for an equal number of specimens. Records of the distribution of the former range of the species may soon replace the observation of the living plant.

(143)

Aspects of Respiration in *Schistosomatum douthitti*

STEFFEN H. ROGERS, *Vanderbilt University*

Respiratory enzyme activity in various stages of the life cycle of *Schistosomatum douthitti* was investigated. Histochemical, quantitative biochemical, and manometric techniques were employed and applied to three stages of the life cycle: the miracidia, the cercaria, and both sexes of the adult stage. Appropriate histochemical techniques were carried out on the cercaria in the snail hepatopancreas and on miracidia in the infected hamster intestine. All other experiments on cercaria and miracidia were carried out on the free swimming organisms. The adults were always studied after being removed from the venules of the hosts' intestine. The respiratory functions of the three stages will be compared. Included will be a comparison of the metabolic activity of the enzymes related to glycolysis, the Krebs' Cycle, and the cytochrome system of each stage. The effects of inhibitors, such as tartar emetic, fluoroacetic acid, nitrogen, and cyanide on the various stages of the life cycle will also be discussed.

(117)

Sequence of Ultrastructural Changes in Mesophyll Cells of Senescing Tomato (*Lycopersicon esculentum*, var. Marglobe) Leaves

STANLEY J. ROUX AND JOHN T. MCHALE, *Loyola University of the South*

Tomato leaf mesophyll cells were examined by electron microscopy during 0-20 days after leaf detachment. Leaves were stored under approximately 1000 ft-candles illumination with petioles in water. Ultrastructural changes became evident after 8 days. The tonoplast, endoplasmic reticulum, and plasma membrane were the first organelles to show abnormalities. Vesiculation of these membrane systems preceded changes in chloroplasts and mitochondria. Coalescence of granal lamellae and vesiculation of stromal lamellae occurred in chloroplasts 11-20 days after leaf detachment. Mitochondria were particularly resistant to senescence. Degenerating organelles were similar in appearance to those observed in senescing wheat, green bean, and cucumber leaves, but the sequence of events differed. Patterns of senescence probably vary with taxa, although differences in methods could account for some variation. The orderly sequence of ultrastructural changes indicates that senescence is not random, but biochemically controlled. The sequence of ultrastructural changes has implications for the physiology of senescence.

(4)

On the Effects of DMSO in Cation Transport by Excised Barley Roots

WALTER E. SCHMID, *Southern Illinois University*

Dimethyl sulfoxide (DMSO), in concentrations of up to 10% by volume, stimulates the uptake of zinc by excised barley roots. In the same concentration it severely depresses uptake of sodium and of rubidium. It does not seem to affect the permeability of the membrane since roots treated with desorption solutions which were 10% in DMSO did not lose more of the preferred ion than did roots desorbed in solutions not containing DMSO. Oxygen utilization (measured in the Warburg Respirometer) was reduced when DMSO was present. It is suggested that DMSO is a poisoning agent which interferes with cation transport by attacking some aspect of metabolism and not by influencing the permeability of the membrane.

(24)

The Preliminary Characterization of Cholinesterase Activity from Etiolated Pea Seedlings (*Pisum sativum* var. Alaska)

OTTO J. SCHWARZ AND G. R. NOGGLE, *North Carolina State University*

The carboxyl ester hydrolase activity of etiolated pea seedlings was investigated. A radiometric assay was used to study the pea seedling's ability to hydrolyze acetylcholine. A spectrophotometric assay utilizing indophenyl acetate was used as a general indicator of carboxyl ester hydrolase activity. Studies concerning pH, metal activation, and inhibition were made. Both activities had a broad pH optimum between pH 7.0 and pH 9.0. Peak activity was approximately pH 8.5 for acetylcholine hydrolysis and approximately pH 7.2 for indophenyl acetate hydrolysis. The cholinesterase activity was found to be strongly inhibited by eserine at 10^{-2} M and completely inhibited by choline at 10^{-3} M. Both activities were inhibited by divalent metal ions. The patterns of eserine and metal inhibition suggested that the two assays were

measuring a complex mixture of enzyme activities. On the basis of these and other criteria the enzyme activity shown by the radiometric assay was tentatively defined as a cholinesterase.

(144)

Ultrastructure of the Caecum of *Schistosomium douthitti*

W. ALLEN SHANNON, *Vanderbilt University*

The ultrastructure of the lining and adjacent tissue of the caecum of *Schistosomium douthitti* is investigated with an Hitachi HS-8 electron microscope.

Plate-like cytoplasmic projections extend from the gastroduermal lining into the lumen of the caecum. Some form "superficial vacuoles" enclosing substances of various densities. Many vacuoles containing material of varying densities are seen within the gastroduermis. This tissue is bordered by a basal area and contains numerous mitochondria exhibiting prominent cristae. Extensive granular and agranular endoplasmic reticula are observed.

Similarities and differences between the gastroduermis of the male and female are compared.

(3)

Calcium Translocation in Bean Seedlings

G. M. SHEAR, *Virginia Polytechnic Institute*

Bean plants were supplied with ^{45}Ca during the period of seed development. The distribution of labeled calcium in the seed and in the seedlings both with and without additional unlabeled calcium was studied. Movement of ^{45}Ca in the seedlings was insignificant.

One cotyledon of bean seedlings was covered in various ways to minimize water loss. The roots were then supplied with ^{45}Ca for a period of six hours after which the cotyledons were removed and ^{45}Ca counted. Cotyledons protected from water loss accumulated calcium at a rate comparable to that of exposed cotyledons, thus showing accumulation of calcium by cotyledons independently from the transpiration stream. This would appear to indicate active uptake of calcium by cotyledons.

(34)

The Computer in the Flora North America Project

STANWYN G. SHETLER, *Smithsonian Institution*

The preparation of the Flora North America (FNA) will be an information problem and process, involving the coordination of a massive operation in searching, compiling, revising, and editing taxonomic data. This information once accumulated should be disseminated by the latest and most effective means of communication, and there should be an easy and rapid means of updating the record. Therefore, the computer will be used whenever possible as an integral part of the Flora program, and it is hoped that innovative applications for taxonomy and related sciences can result. Work is in progress toward the development of an automated bibliography, and programs have been written to enable the computer to construct and print dichotomous identification keys. A generic list of North American plants has been compiled by computer, and additional compilations are planned. Eventually, completed text is to be stored in a central data bank which in due course may be available to the individual scientist by means of remote teletype units. A report on progress to date will be given.

(135)

Teratogenic Effects of Direct X-irradiation on the Otic Vesicle of the Chick Embryo

CHARLES A. SINGHAS, *Wake Forest University*

A total of 125 chick embryos were irradiated at stages 9 and 20 (Hamburger and Hamilton) within two dose ranges (100 to 800 R and 1000 to 2000 R). Embryos exposed to the lower dose range were sacrificed at 7 and 10 days of incubation and those exposed to the higher dose range were sacrificed at 12, 18, and 24 hours post irradiation. Initial results indicate a radioresistance at dose levels below 700 R followed by suppressed development, necrosis, and degeneration within the higher dose range.

(205)

Territorial Behavior of the Dwarf Cichlid, *Apistogramma ramirezi*

GARY C. SMITH, *University of Georgia*

Male and female individuals of *Apistogramma ramirezi* exhibit strong territorial behavior when properly established in laboratory aquaria. An intricate stimulus-response chain, with appreciable overlap, characterizes the interaction that results when this species is defending its territory. The primary sign-stimuli for the establishment of territories appear to be the rock caves in the aquarium which offer a maximum of protection for this small fish as well as a suitable spawning site. Displacement for this species consists of digging in the substrate and attack of inferior tank mates in the vicinity of a border dispute. This species exhibits three color patterns which are quite distinct and appear to be under hormonal control: the vertical-bar pattern of dominant males, the ocellated spot pattern of dominant females, and the broken horizontal-bar pattern of defeated fish of both sexes. Judging from this fish's response to colored models, the release of appeasement or aggression in this species requires a combination of color pattern, fin positions and synchronized movements.

(82)

Decapod Crustacean Burrows of Callianassids as Possible Paleoenviromental Indicators

K. L. SMITH, JR., *University of Georgia*

The use of fossil callianassid burrows as paleo-environmental indicators was evaluated by comparatively studying recent burrow morphology and environments of three Atlantic coast callianassid crustaceans, *Callianassa major*, *Callianassa atlantica*, and *Upogebia affinis*. Data were collected at Sapelo Island, Georgia; Beaufort, North Carolina; and Indian River Bay, Delaware. Results indicated interspecific differences in burrow morphology and associated ecological parameters. Burrow morphological differences included interior diameter, wall thickness, and resting chamber dimensions. Environmental differences were reflected by infaunal associates. Infaunal associates of *C. major* suggested a high energy beach environment, while *C. atlantica* associates indicated a protected low energy beach area. *Upogebia affinis* associates suggested an estuarine environment. Interspecific differences in burrow morphology and associated environments suggest further use of fossilized callianassid burrows as paleoenviromental indicators.

(81)

Application of X-ray Radiography to the Study of Burrowing Marine Organisms

K. L. SMITH, JR., *University of Georgia*,
JAMES D. HOWARD, *Marine Institute, University of Georgia*, AND TAYLOR MAYOU, *University of Iowa*

The burrowing behavior of marine organisms is important in ecological and paleo-ecological studies, but is difficult to observe in the field or laboratory. X-ray radiography has proved to be a convenient way to study burrowing activity of small infaunal organisms. The technique permits observation "into" the sediment without destroying the organisms or the burrowing structures which they produce. Time lapse x-ray radiography permits examination of progressive changes in burrow formation and sediment reworking through time.

To date the burrowing activity of 30 intertidal invertebrate species from the Georgia coast have been examined. These studies were performed using artificially and naturally stratified sediments in aquaria supplied with continuously flowing sea water. Conditions of environmental erosion, deposition, and fluctuations of water level were simulated to determine their affect on the organism's burrowing behavior.

(56)

Growth and Energetics of *Chlorella pyrenoidosa* Chick

JERRY SMOSKY AND G. T. COWLEY,
University of South Carolina

Chlorella pyrenoidosa Chick was grown in Knopp's nutrient solution at a starting pH of 6.8 and under the following environmental conditions: 200-225 foot candles, 25° C., and ambient atmospheric CO₂.

The growth curve approached the typical sigmoidal pattern. The average dry weights ranged from 21.0 mg./liter at 2 days to 312.0 mg./liter at 16 days.

Ash accounted for 7.23% (day 16) to 12.59% (day 2) of the dry weights. Carbon content ranged from 45.85% of the ash-free dry weight (day 2) to 57.84% (day 14). Mineral analyses were as follows: magnesium, 0.82 to 1.32%; potassium, 1.81 to 3.18%; phosphorus, 0.09 to 1.32%; and iron, 0.10 to 0.24% of the dry weight. In general the content of magnesium, potassium, and phosphorus decreased as the cultures aged. No such relationship could be detected for iron.

Average energy values ranged from 3764 calories per gram dry weight at 2 days, to 4594 calories per gram dry weight at 16 days. On the basis of ash-free dry weight, values ranged from 4307 calories per gram at 2 days, to 5047 calories per gram at 20 days.

(132)

Reproductive Behavior of the Fork-Tailed Katydid, *Scudderia furcata*: Copulation

JOHN D. SPOONER, *Augusta College*

Sexual pairs in the fork-tailed katydid are formed by the male and female homing toward sounds produced by the opposite sex. First contact is with the antennae. The male turns around, and the female mounts the male from behind. The male cerci clasp the female near the base of the ovipositor, and the female is held loosely while the male produces a spermatophore. The spermatophore is forced into the vagina by the male's closing his subgenital and supra-anal plates. The female often bites the dorsum of the male while the spermatophore is being transferred. The female eats the spermatophore after copulation.

(133)

Reproductive Behavior of the Fork-Tailed Katydid, *Scudderia furcata*: Egg-laying

JOHN D. SPOONER, *Augusta College*

Scudderia furcata oviposits in leaves. Females select oviposition sites with the palpi. Once a spot is chosen, the female straddles the edge of the leaf, bites the edge of the leaf to open it, brings the ovipositor forward ventrally, grabs both ovipositor and edge of leaf with mandibles, and inserts the ovipositor into the leaf by sawing motions of the valvulae. One egg is laid at a time. After each egg is laid, the female grooms the entire ovipositor.

(193)

An Ecological Study of a Mature Stand of *Pinus taeda* of the Congaree Swamp

RICHARD STALTER, *University of South Carolina*

An ecological study of a mature stand of *Pinus taeda* in the Congaree swamp was conducted during the months of November and December, 1967. The stand was sampled by means of 20 quadrats, each of sufficient size to account for herbaceous, frutescent, and arborescent species. The paucity of pine reproduction and copious development of hardwoods suggests that the pine sere has almost reached its culmination, but in doing so has existed as such for a much longer period than similar seres elsewhere.

(152)

Parasitization of *Chortophaga viridifasciata* Eggs by Larvae of *Scelio bisulcus*

RALPH E. STEPHENS, MADISON B. COLE, JR.,
ADA A. COLE, AND J. GORDON CARLSON,
The University of Tennessee

Parasitization of adults and nymphs of the grasshopper *Chortophaga viridifasciata* (DeGeer) collected in the fields is not unusual, but parasitization of eggs laid and maintained in the laboratory has not been found until now. We have recently discovered one egg pod in which all of the eggs were parasitized by the Hymenopteran wasp *Scelio bisulcus* (Ashmead). The parasitized pod was collected from a cage housing adult grasshoppers which were caught in Knox County, Tennessee, in late July 1967. The eggs of the wasp must have been deposited in the eggs of the grasshopper either inside the body of the grasshopper or in the pod under sand. After fourteen days development at 26° C, the wasp larvae were observed to ingest and digest intact yolk granules. Scelionidae are known to parasitize eggs of Orthopterans, but heretofore no description of *S. bisulcus* larvae are known to exist. Adult *S. bisulcus* hatched after seven weeks of incubation as compared to the six weeks normally required for *C. viridifasciata*. (This study was supported in part by Atomic Energy Commission contract AT-(40-1)-2575.)

(77)

A Limnological Study of the Invertebrates of a Tennessee Cold Springbrook

MICHELE S. STERN, *Tulane University*, AND
DANIEL H. STERN, *Louisiana State University*
in New Orleans

A one-year limnological investigation was conducted on an unnamed cold springbrook in Putnam County, Tennessee. The study was undertaken to analyze the

components of invertebrate biocoenoses, to record population fluxes, and to determine possible factors affecting abundance and interactions between members of the communities of a relatively uniform habitat. Fifty-five species of invertebrates were recorded. Relative abundance was greatest in February and lowest in July. The surrounding deciduous forest was determined to have the greatest effect on the composition and abundance of the fauna of the springbrook.

(200)

Correlations between Soil Moisture and Vegetational Types of an Island

SAMUEL M. STUBBLEFIELD, JR.,
Tennessee Technological University

The range of available soil moisture in its relation to vegetational types was investigated over a period of nine months. Random soil samples were taken at depths of 3" and 12" in the experimental area of 700 acres at weekly intervals. The moisture content and the permanent wilting percentages of the soil samples were determined. Quantitative vegetational analysis was made to ascertain the pattern of distribution in relation to the soil moisture content. Positive correlations were established between the amount of available soil moisture in each of the sampling areas, and the types of herbaceous and woody flora. Variations in the available soil moisture content at the 3" and 12" soil levels were also observed. The influence of available soil moisture at depths of 3" and 12" and the permanent wilting percentages of the soils involved were definite factors in the determination of vegetational types.

(2)

Influence of Diquat, Paraquat, and Several Surfactants on the Loss of Betanin From Beet Root Discs *In Vitro*

D. L. SUTTON AND C. L. FOY,
Virginia Polytechnic Institute

Betanin, a flavonoid pigment, is slowly released from fresh root discs of *Beta vulgaris* L. *in vitro*, and its rate of appearance as measured by spectrophotometry (max. 538 mμ) may be used as a criterion in studying alterations in membrane permeability. Diquat (6,7-dihydrodipyrido [1,2-a:2',1'-c] = pyrazidiinium salt) at 10^{-3} and 10^{-4} M inhibited the release of betanin; lower concentrations of diquat and 10^{-3} M paraquat (1,1'-dimethyl-4,4'-bipyridinium salt) gave readings comparable to the controls. The cationic surfactants Aerosol C-61 and Hyamine 1622, at concentrations from 0.001 to 1.0%, caused a rapid release of betanin. Nonionic surfactants Tween 20 and Tween 80 also enhanced the release of betanin but less dramatically. Six or 12 hour pretreatments with either diquat, paraquat, Tween 20, or Tween 80 did not nullify the drastic action of the cationic surfactants.

(1)

Absorption of 2-chloro-4,6-bis(ethylamino)-s-triazine (simazine) by Excised Roots of *Hordeum vulgare* L. (var. Wong)

DAVID L. SUTTON, D. W. JONES, C. W. LAUGHLIN AND
M. G. HALE, *Virginia Polytechnic Institute*

The mechanisms whereby organic compounds are actively absorbed are probably very similar to absorption of inorganic ions. Information is available on the uptake of organic herbicides by intact plants, but few studies have been conducted with excised root systems.

Simazine absorption by roots of intact plants is generally assumed to occur by a passive mechanism. Results with excised barley roots indicate absorption of simazine occurred by both a passive and active process. Within 30 minutes, approximately one-half of the simazine- C^{14} was absorbed with a reduced absorption rate for the next one and one-half hours. At the end of the two hour absorption period, roots were placed in distilled water or non-radioactive simazine and lost approximately 75 percent of the absorbed simazine within 15 minutes. Boiling or treatment with dinitrophenol reduced the active uptake of simazine.

(95)

Changes in the Carbohydrate Content During Metamorphosis of the Blowfly, *Phormia regina*

LAURENCE G. TATE AND LARRY T. WIMER,
University of South Carolina

Changes in the carbohydrate content of *Phormia regina* were determined at 24 hr intervals during metamorphosis. The non-glycogen carbohydrates were extracted from individual lyophilized animals with 70% ethanol. The remaining residue was treated with hot 4% NaOH to extract glycogen. Glycogen was isolated by precipitation in 70% ethanol and quantitated with anthrone. The non-glycogen carbohydrate fraction was purified on Dowex 1 and 50. The sugars were then separated by thin-layer chromatography and quantitated on a densitometer. The prepupa contained 848 μg of glycogen. Glycogen declined to 293 μg 24 hr later and to 243 μg by eclosion. Glucose and maltose showed similar values (18 μg) in the prepupa and increased to 155 μg and 96 μg, respectively, 24 hr later. In the newly emerged adult glucose had decreased to 77 μg and maltose to 14 μg. Trehalose remained constant (about 21 μg) during metamorphosis but increased strikingly (to 55 μg) at eclosion.

(167)

Tissue Anomalies in Tree Species Following Fast Neutron or Gamma Irradiation

FRED G. TAYLOR, JR., *Oak Ridge National Laboratory*

Gross morphological characters (such as puckering and wrinkling in leaves) are among parameters used to assess radiation effects in higher plants. While these descriptions are meaningful there is a greater need for anatomical clarification so as to convey knowledge of internal structures and possible alterations in functions of tissues. In contrast to gamma radiation, studies at ORNL have shown that exposures to fast neutrons yield qualitatively similar results in woody species. Radiation induced modifications in foliar tissues have been characterized for 9 genera of deciduous trees surrounding the Health Physics Research Reactor, while similar damages (gamma induced) have been observed in a conifer. Damage to shoot apical meristems are depicted in pines. Fusion of main and axillary stems has been recorded for 3 deciduous genera. These morphological features are defined anatomically to illustrate a type of radiation damage in representative genera. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(64)

Ecology of Red Mangrove Seedling Establishment

HOWARD J. TEAS, *University of Miami* AND
FLORENCE MONTGOMERY, *University of Georgia*

The red mangrove, *Rhizophora mangle*, ordinarily drops its seedlings into the water where typically they

float unrooted until the lower end comes to rest in contact with a suitable substrate. With view to understanding the ecological factors in mangrove establishment, several factors were tested. The effects of fresh versus salt water, light versus dark, mud versus sand, scraped radicle versus unscraped radicle, and geotropic posture were studied. Rooting occurred better in the dark than light, but very little rooting was found in salt water in the light; scratching of the radicle did not aid rooting; and seedlings in salt marsh mud with salt water grew best. A geotropic righting of horizontally placed seedlings was observed. The probable role of these findings in mangrove establishment and survival is discussed.

(172)

Effect of Bottom Substrates on the Bivalve, *Rangia cuneata*

KENNETH R. TENORE, *North Carolina State University*

The effect of bottom sediment composition on *Rangia cuneata* was investigated in the Pamlico River estuary, North Carolina. Mortality, meat-shell weight ratio, and shell growth were evaluated in relation to particle size, organic matter concentration, and phosphate concentration. *In situ* factorial experiments were carried out for 5 months using individually marked clams placed in boxes of predetermined sediment composition. Clay-silt sediments were an unfavorable environmental substrate. High levels of organic matter or phosphate intensified this effect, suggesting that the physical and chemical environment of fine sediments was responsible. However, in sand sediments, high levels of organic matter and phosphate were found favorable to *Rangia*.

To clarify these results, clams were placed in trays with sediment containing Zinc-65 labeled detrital matter and Phosphorus-32. The results indicated that *Rangia*, although a typical filter-feeding bivalve, can accumulate these materials from the sediment. Such mechanisms are suggested as a possible cause of the better growth observed in sand sediments with moderately high levels of organic matter and phosphate.

(94)

Metabolic Fate of ^{14}C -Isoleucine in Non-Egg-Laying Female *Aedes aegypti* (L.)

WILLIAM L. TIETJEN, *Georgia Southwestern College*,
AND JAMES N. LILES, *The University of Tennessee*

The ^{14}C activities of lipid, protein, and soluble extract fractions were determined over 6 weeks following ingestion of L-isoleucine- ^{14}C by non-egg-laying female *Aedes aegypti* (L.). 80 per cent of the initial activity was lost from the free isoleucine pool during the first day with only 1 per cent remaining in this pool after 10 days. 10 per cent of the ingested ^{14}C was lost through excrement, most being lost during the first two days. 15 per cent was lost to $^{14}\text{CO}_2$ over the 6 weeks. Lipid incorporation of the ^{14}C plateaued by 6 hours at 5 per cent of the ingested value. 50 per cent of the ^{14}C was incorporated into the protein fraction within 6 hours, with a high of 80 per cent being reached by 2 days. The decrease in total and protein ^{14}C were parallel, suggesting that the ^{14}C of the $^{14}\text{CO}_2$ came from the protein ^{14}C .

(73)

Bird Species Diversity and Ecological Succession

ELLIOT J. TRAMER, *University of Georgia*

Species diversity indices were calculated for 986 breeding bird populations from a wide variety of ecosystems. The index used was $H(s) = -\sum p_i \ln p_i$, where p_i is the

proportion of individuals in the i -th species ($i = 1, 2, \dots, s$). Within a given series the diversity increased with the age of the community, leveling off as the system reached maturity. Although tropical savanna and wooded communities had higher diversities than their temperate counterparts, grasslands were found to have comparable diversities at all latitudes. Much of the existing bird census data were found to be inapplicable to the study of successional gradients, since many supposedly homogeneous tracts were, in fact, heterogeneous, and plot sizes were often too small or too large. It is suggested that a knowledge of the diversity changes in truly homogeneous seral stages enables one to estimate the degree of heterogeneity of a census area from its species diversity index.

(107)

Further Studies on Water-Soluble Cytochromes from Blue-Green Algae

LINDA S. TUCK AND RAYMOND W. HOLTON,
The University of Tennessee

An improved method for the separation of water-soluble cytochromes from aqueous extracts of lyophilized algae has been devised. This procedure makes use of an initial separation on a Sephadex G-75 column. Despite an overlap in the elution of phycocyanin and the initial cytochrome fractions, the majority of phycocyanin is separated from the cytochromes. Partial separation of the individual cytochromes from *Anacystis nidulans* occurs on the Sephadex and complete separation can be carried out on a DEAE-cellulose column. When extracts from *Chlorogloea fritschii* are analyzed by this procedure, only a single cytochrome is observed. It is the f-type cytochrome with α -peak at $554 \text{ m}\mu$ and is apparently similar to those found in other photosynthetic organisms; however, the other c-type cytochrome with α -peak at $549 \text{ m}\mu$ found in *Anacystis* has not been detected in *Chlorogloea*. The results of further extractions and characterization of cytochromes from *Chlorogloea* grown heterotrophically and under conditions in which it fixes nitrogen will be described.

(80)

Biological Assimilation and Turnover of Three Radioisotopes by Crickets (*Acheta domesticus*)

ROBERT I. VAN HOOK, JR.¹ AND D. A. CROSSLEY, JR.¹
Oak Ridge National Laboratory

The use of radioactive isotopes for measuring food consumption and energy flow in insect populations requires careful assessment of assimilation and turnover rates. In separate experiments, three radioisotopes (^{134}Cs , ^{51}Cr and ^{131}I) were fed to adult brown crickets for a 24-hr period. The insects were then transferred to nonradioactive food and their whole-body radioactivity measured at 1-hr intervals. The retention of each of the three radioisotopes can be described by a negative exponential equation consisting of two components, a shorter one related to loss of unassimilated radioisotope from the gut and a longer one describing excretion of assimilated radioisotope from tissues. The shorter components had similar rates (half-time = about 4 hrs) for all three radionuclides, indicating that it was indeed a measure of gut clearance. Chromium had the lowest assimilation (6%) and cesium the highest (65%). Assimilated ^{134}Cs and ^{51}Cr were eliminated at moderate rates (biological half-lives of 62 and 83 hrs, respectively), but assimilated ^{131}I was stored rather than excreted.

¹ Present addresses are Clemson University and University of Georgia.

(156)

Interaction Between Virus and Susceptibility Gene for Tumor Development in Mice

BASUDEO VARMA, *Georgia Southern College*

For the elucidation of viral relationship with genetic susceptibility in the development of spontaneous mammary tumors, two strains of mice—one designated as X, resistant to the development of mammary tumors, and a second strain designated as IBA/Ha, of which 95% breeding females develop spontaneous mammary tumors, were used as the experimental materials. Mice of the X strain are free from any viruses whereas the mice of the IBA/Ha strain contain two types of virus particles—A and B in their mammary glands and in their mammary tumor tissues. In mammary tumors, developed among F_1 breeding female mice of a cross between IBA/Ha female - X male, dough-nut shaped virus particles (A) varying in size from 110-120 μ in diameter were seen in the cytoplasm and nucleoid type (B) particles (135-160 μ) were observed budding in the intercellular space from the plasma membrane. Similar particles were also observed in the tumors developed among the second generation mice from the above cross, but intracytoplasmic particles (180-220 μ) were seen in addition to A type particles in these tumors.

Development of mammary tumors in these two strains of mice is genetically controlled by two complementary genes, gene C inherited by the IBA/Ha strain and gene B by the X strain of mice. Transmission of virus particles in F_2 albino mice from their maternal grandparents of IBA/Ha strain, probably render these mice susceptible to interaction between virus particles and the susceptibility gene for development of mammary tumors. Presence of virus in a strain of mice which is otherwise tumor resistant, could make it vulnerable for the development of spontaneous mammary tumors. Further work is needed to show which of these two types of virus particles—A or B interact with the susceptibility gene for the development of mammary tumors in these F_2 hybrid mice.

(180)

Environmental Control of Oxygen Consumption in Cotton Rats

C. KENYON WAGNER, *University of Georgia*

Oxygen consumption was studied in the cotton rat, *Sigmodon hispidus* using a Beckman G-2 Paramagnetic Oxygen Analyzer. Animals were placed in respirometers and held for eight hours at each of the following temperatures: 10°, 15°, 20°, 25°, 30°, and 35° Centigrade. There was a linear relationship between oxygen consumption (Y) and environmental temperature (X) from 10.0° to 22.5° C. as shown by the equation: $Y = 4.40 - .11X$ cc. O_2 /gm.hr.⁻¹. The average oxygen consumption at 10° C. was 3.37 cc. O_2 /gm.hr.⁻¹ and dropped to 1.96 cc. O_2 /gm.hr.⁻¹ at 22.5° C. The zone of thermal neutrality extended from 22.5° to 30.0° C. with the average oxygen consumption 1.96 cc. O_2 /gm.hr.⁻¹. At temperatures above the upper limit of thermal neutrality oxygen consumption rose to 2.36 cc. O_2 /gm.hr.⁻¹.

(195)

Southern Mixed Hardwood Forest in the Virginia Coastal Plain

STEWART A. WARE, *College of William and Mary*

Analysis of the more mature portions of the College Woods at Williamsburg revealed a strong relationship to the Southern Mixed Hardwood Forest described by

Quarterman and Keever. Ten of their twelve Group I overstory species were present; those missing (magnolia and laurel oak) do not range so far north. The sampled stand had a coefficient of similarity with the SMHF abstract of 60%; Group I species contributed 61% of the total tree layer Importance Value. White oak, beech, loblolly pine, tuliptree, and southern red oak were the dominants, and dogwood, red maple and American holly were the most important understory species. The sampled community differs from the SMHF in the high importance of tuliptree and red maple. Wells noted the importance of these species in North Carolina Coastal Plain climax forests; quantitative studies there are necessary to determine if these species generally become more important in the northeastern extension of the SMHF.

(110)

Lactic Acid Fermentation in *Achlya ambisexualis* (Order Saprolegniales)

CHARLES O. WARREN, NORA HARVIN, AND WILLIAM TURNER, *Southwestern at Memphis*

Although numerous reports have appeared concerning lactic acid fermentation in phycomycetous orders such as the Blastocladiales, Leptomitales and Mucorales, little attention has been given to the existence and significance of this metabolic pathway in the closely-related order, Saprolegniales. Lactic acid production in *Achlya ambisexualis* was demonstrated using a colorimetric assay for lactic acid accumulation in the medium. The fungus carried out lactic acid fermentation under highly aerobic (shake-culture) conditions, although the amount of lactic acid in the medium increased eight to ten-fold under stationary conditions. The rate of glucose assimilation was compared to the rate of lactic acid production under varying cultural conditions. Preliminary electrophoretic analyses of cell-free extracts demonstrated the presence of a lactic dehydrogenase appearing as a single anodic band. Studies of lactic acid fermentation in relation to asexual and sexual morphogenesis were conducted.

(25)

The Effects of Temperature on Water Potential and Water Movement in Plants

CHARLES P. WEATHERSPOON, *Duke University*

Spanner (Introduction to Thermodynamics, Academic Press, N. Y., 1964, p. 207) states that a change of "one degree centigrade is equivalent to over eighty atmospheres [change in water potential], in the sense that water will distill from an open solution of eighty atmospheres osmotic potential to pure water maintained at only one degree centigrade below it." This suggests that the temperature gradients commonly occurring within plants should have enormous effects on water movement through plants, largely overshadowing pressure, osmotic, and matric components of water potential. Experience shows that this is not the case, however. A consideration of the properties necessary for the functioning of a thermosmosis apparatus shows that while liquid water movement is very sensitive to temperature gradients under certain special conditions, these conditions are practically absent in plants. Therefore, although temperature does indeed strongly influence water potential, the temperature "component" of water potential is largely ineffective in influencing water movement in plants.

(179)

The Effect of Temperature and Radiation on Litter Size in *Peromyscus polionotus*

J. R. WELLS, J. L. CARMON, AND M. H. SMITH,
University of Georgia

The animals used for this study were trapped in the wild and have been maintained in the laboratory for seven generations. A factorial experiment with three levels of temperature and three levels of radiation was conducted. The male parents of generations 2 through 7 received either zero, 100r gamma, or 200r gamma radiation one week before they were mated to a single female. The animals were maintained at either 60°, 75°, or 90° F, in generations 5 through 7. The average number of young born alive in first litters of generations 2 through 7 was 3.02, 3.04, and 2.95 for the zero, 100r, and 200r, radiation levels respectively; no significant differences were noted. An analysis of all litters in generations 5 through 7 indicate a significant difference in litter size between the 100r and 200r radiation groups. Significant differences in litter size were found between all three temperature levels. Generation effect and temperature X radiation interaction has also been studied.

(150)

A Preliminary Report on Gametogenesis and Fertilization in the Heterogonic Life Cycle of *Rhabdias ranae* Walton, 1929

MARTHA H. WHICKER AND FELIX H. LAUTER,
University of South Carolina

The somatic, diploid, and haploid chromosome numbers were determined in the syngonic female (24, 12, eggs six, spermatozoa five or six), free-living female (24, 12, six), and free-living male (22, 11, five or six). In the parasitic hermaphrodite primary oocytes can be found in leptotene, zygotene, and pachytene stages. In the synapsis zone six tetrads in early diplotene can be observed. The chromosomes seem to disappear in the growth zone and reappear in the oocyte just prior to fertilization. After sperm penetration the egg nucleolus and nuclear membrane disintegrate. In the egg the six condensed tetrads move to the periphery and form two polocytes by rapid meiotic divisions. In the syngonic female, spermatogenesis occurs in the testis region. Primary spermatocytes in diplotene and diakinesis show five large tetrads and two small dyads. Meiotic divisions are pre-reductional. In anaphase I the two small dyads (heterochromosomes) are found lagging on the spindle. When division is completed, each secondary spermatocyte has one small and five large dyads. In the equational division one of the lagging heterochromosomes is lost when cytokinesis occurs forming two spermatids, one with five and one with six chromosomes. As the spermatozoa pass through the growth zone the chromosomes condense and spermiogenesis is completed.

The free-living male and female are presently being investigated.

(192)

Vegetational Patterns Along An Altitudinal Gradient — Community or Continuum?

DENNIS WHIGHAM, *University of North Carolina*

The vegetation of Bluff Mountain, Ashe County, N. C., is a mosaic of vegetation types which apparently intergrade into one another. This study of the vegetation of the North slope of the mountain indicates that three recognizable communities occur along the altitudinal gradient. These communities correspond to the low

elevation cove forest, higher elevation sub-type of cove forest, and Oak-Chestnut forest as described for the vegetation of the Great Smoky Mountains. *Acer saccharum* is the dominant of the low elevation cove forest. *Betula lutea* is the dominant of the higher elevation sub-type and *Quercus rubra* var *borealis* is the dominant of the Oak-Chestnut forest of the ridges.

(50)

Taxonomic Studies on the Genus *Dinemasporium*

JOSEPH C. WHITE¹ AND LAFAYETTE FREDERICK,
Atlanta University

The genus *Dinemasporium* has been subjected to critical review in order to clarify speciation, provide additional information on the manner of spore development, and elucidate the status and probable relationships of closely allied genera. These studies reveal that the generic diagnosis of *Dinemasporium* should be emended to include those morphologic variations now known to occur as additional typifying characters of the genus.

Thirty-four species and several varieties have been assigned to the genus. Results from our comparative studies of available type specimens suggest that only 11 species and 2 varieties be recognized as the taxa comprising *Dinemasporium*.

Spore formation appears to be murogenous in origin. The position and number of setulae on spores may vary with the species. Setulae may be present at each end of a spore or they may be laterally attached. The origin and structural nature of these setulae is still obscure. It does not appear as if they represent protrusive outgrowths from the spore wall.

¹ Present address: Department of Plant Pathology, Washington State University.

(177)

How Long Will Diapause Larvae of *Mormoniella* Live?

P. W. WHITING, *Oak Ridge National Laboratory*

Diapause larvae, larvae arrested in development at the fourth instar, have been reported to live at "room temperature" for two or even three years. If they are subjected to three months refrigeration, 4° C, the diapause is potentially broken, for upon removal from the refrigerator, they will pupate and eclose. If left in the refrigerator, they may safely be stored for well over a year. Larvae of several different stocks were refrigerated. Some were incubated after seven months and formed large, fertile adults. The remainder, examined after 22 months, were for the most part shriveled or completely dry but some were living although reduced in size. Incubation at 30° C induced pupation and the different stocks were recovered in active condition. (Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(63)

Compartmental Analysis of Production and Decay of *Juncus roemerianus*

RICHARD B. WILLIAMS, *Oak Ridge National Laboratory*,
and MARIANNE B. MURDOCH,
U. S. Bur. Commercial Fisheries

The rates of annual net production and decay of *Juncus* (needle rush) in a salt marsh near Beaufort, N. C. were determined by fitting field data into a compartmental model in which individual culms moved through three successive compartments: live, dying and dead.

Average standing crops (dry wgt./m²) for the compartments were respectively, 340 g, 500 g, and 1600 g; the number of turnovers per year were respectively, 2.5, 1.7 and 0.53. Annual production was 850 g (dry wgt.)/m². The rate of production was greatest in summer and least in midwinter.

(178)

Influence of Temperature Upon the Susceptibility to Acute Irradiation in *Peromyscus polionotus*

ROGER G. WILLIAMS, MICHAEL H. SMITH, AND
JAMES L. CARMON, *University of Georgia*

The influence of temperature upon the susceptibility to acute whole irradiation has been studied in an attempt to find the effects upon the days until death and the LD_{50,30}. The test population was reared in a temperature controlled environment of 24° C. The mice were subjected to whole body irradiation from a Co⁶⁰ source at either the 1000r, 1100r, 1200r, or 1300r, level. Following irradiation, the mice were placed in individual cages in either of three temperature control rooms; 15° C, 24° C, or 32° C. Each of the twelve radiation temperature subgroups consisted of 10 males and 10 females. The LD_{50,30} ranged in the subgroups from 1102r for the males at 15° C to 1213r for the females at 32° C. The analysis of variance using the average number of days until death showed that a difference between the 1000r level and the other levels was significant (5% level) as well as a significant difference between the two temperature extremes.

(96)

The Non-Glycogen Carbohydrates of the Larval Hemolymph and Fat Body of *Phormia regina*

LARRY T. WIMER, *University of South Carolina*

Trehalose, frequently recognized as the predominant blood sugar of insects, is apparently absent from the hemolymph of larval Diptera. Since trehalose has been detected in whole dipterous larvae, an attempt was made to elucidate these seemingly conflicting reports. Non-glycogen carbohydrates were extracted from lyophilized fat bodies and fresh hemolymph using 70% ethanol, then purified with Dowex resins. Photodensitometry of thin-layer chromatograms permitted specific microdetermination of the sugars. Glucose, the predominant blood sugar, declined from 155 mg% in the early third instar larva to 61.5 mg% at puparium formation. Maltose was detected in trace amounts in the hemolymph during third instar development, while trehalose was not detected until puparium formation. The fat body contained trehalose and glucose throughout third instar development and at puparium formation showed values of 10.5 µg/fat body and 3.9 µg/fat body, respectively. An unidentified compound (probably carbohydrate) appeared at puparium formation and may have a developmental significance.

(140)

A Guide to the Formed Elements in Human Blood Stained with Wrights Stain

JOHN D. WITHERS, *Clark College*

Application of the principle of the Diagnostic key to the teaching of blood cell morphology has proven valuable in Histology, Elementary Biology and Hematology classes. Its use provides the teacher with an effective tool and the student with a means by which he can develop accuracy in examination of blood smears stained with Wrights stain.

(186)

Genetic Factors Relating to Radiosensitivity of *Populus deltoides*

J. P. WITHERSPOON, *Oak Ridge National Laboratory*

In studying biological effects of ionizing radiation on cells, tissues and organs, genetic factors relating to radiosensitivity are usually constant. However, when these effects are sought at a population level of organization, the differential responses of individuals (genotypes) lend much variance to experimental results. Radiobiological studies using clones (asexually propagated cuttings) of eastern cottonwood permitted replication of genotypes under controlled environmental conditions. Responses of clones to both gamma and fast neutron radiation indicated that genotypes may exhibit wide differences in radiosensitivity due to genetic control of growth rate, biological timing and tissue differentiation. Clonal variations in the relative biological effectiveness of fission fast neutrons compared to ⁶⁰Co gamma rays also were found as a result of growth rate differences. (Research sponsored by USAEC under contract with the Union Carbide Corporation.)

(37)

A Preliminary Biosystematic Study of *Erythronium americanum* Ker (Liliaceae) in the Southeastern United States

B. EUGENE WOFFORD, *University of South Alabama*,
AND WILLIAM H. ELLIS, *Austin Peay State University*

Variations in the yellow flowering species of the genus *Erythronium* in the southeastern United States have recently been of considerable taxonomic importance. The existence of these variations between and within single populations of *Erythronium americanum* were suggested to the author and served as a basis for the study. Particular biosystematic emphasis was placed on the purple and yellow anther color forms of *Erythronium americanum*. Inferences were made from geographical, ecological, cytotaxonomical, anatomical, and morphological data compiled from both fresh material and herbarium specimens. Statistical analysis were employed where they seemed pertinent. The results of this preliminary investigation indicate that two distinct biotypes of *Erythronium americanum* exist and are best distinguished on the basis of anther coloration. Although it now appears that these two biotypes should be placed in the taxonomic category of forma, formal taxonomic recognition will not be presented until variations are sufficiently biosystematically studied throughout the entire range.

(67)

Non-petrified Fossil Spores in Sediments

FREDERICK A. WOLF, *Duke University*

Alluvial deposits and sediments of lakes and of other bodies of water contain the remains of animals and plants, especially pollen and fungal spores. This report is concerned with spores of fungi in sediments from lakes in Uganda, Kenya, Zambia, and Tanzania. The age of these sediments dates from the termination of the Ice Age.

The spores were sparse in some lakes and were abundant in others. Some kinds resembled contemporary genera, and therefore could be identified with a reasonable degree of assurance. Paucity of spores in certain of the lakes seems to be due to (1) year after year burning of the vegetation, (2) protracted periods of drought, (3) sporadic volcanic eruptions, and (4) grazing pressure from herds of wild and domestic animals.

It was anticipated that spores of certain widely prevalent genera would occur in the sediments and reasons for their non-occurrence were sought. It was learned that certain kinds are readily decomposed, if stored in sediment, and that some are destroyed by treatments employed in the preparation of materials for microscopic examination.

Apparently certain genera have not undergone change in morphology during the period that has elapsed since the termination of the Ice Age. The survival of the species must have depended upon evolutionary changes in their physiology, that resulted in their adjustment to the vicissitudes of climatic and other environment changes.

(19)

Enzymatic Activities in Leaves of Light-grown and Dark-grown Wheat Seedlings

FREDERICK T. WOLF, *Vanderbilt University*

Seedlings of wheat, var. Seneca, were grown either in continuous darkness or under a 14-16 hr. photoperiod for one week, at which time the relative activities of a number of enzymes were assayed in crude extracts obtained from the leaves. The enzymes studied were invertase, trehalase, raffinase, lipase, galactokinase, aldolase, glucose-6-phosphate dehydrogenase, acid phosphatase, urease, indole acetic acid oxidase, alcohol dehydrogenase, ascorbic acid oxidase, catalase, and peroxidase. Raffinase, ascorbic acid oxidase, and peroxidase levels were higher in dark-grown seedlings. Activities of all other enzymes studied were greater in light-grown seed-

lings, and ranged up to 3.5 times those in dark-grown plants. No significant differences in the degree of respiratory inhibition induced by cyanide or azide, or of respiratory stimulation by 2,4-dinitrophenol, were found.

(168)

Development of the Gametophyte of *Woodwardia areolata* in Sterile Culture: The Effects of Exogenous Sucrose

FRED T. YEATS, *University of Mississippi* AND
University of South Carolina

Germinating spores of *W. areolata* (L.) Moore, sectioned at ten microns and stained, reveal a centrally located nucleus, which migrates to the spore wall and there divides. The subsequent, unequal, tangential cell division forms a small achlorophyllous rhizoidal cell. The larger cell then divides transversely, forming a large chlorophyllous prothallial cell.

Prothallia of *W. areolata* were cultured in Knudson's mineral medium supplemented with sucrose in concentrations varying from 0% to 4%. The effect of the varying sucrose concentrations was confined to a retardation of development at concentrations of 3% to 4%, and an enhancement at concentrations of 0% to 1.5%. This was the only effect noted. There was no significant difference in developmental patterns or in time of initiation of sex organs on the various sucrose concentrations. Branching prothallia occurred on all media except that containing 1% sucrose, and embedded antheridia were noted in prothallia grown on all media.

News of Biology in the Southeast

Joseph F. Fitzpatrick, Jr. — Editor

About People

Jean Givens, Instructor in Biology, Georgia State College, Atlanta, has been appointed a Director of the Newly-formed Azalea Chapter of the National Rhododendron Society. Persons interested in its activities may contact the Secretary, David E. Cook, 3288 Embury Drive, Chamblee, Georgia.

Richard Dennis Ewing has joined the Developmental Biochemistry Group of the Oak Ridge National Laboratory, Oak Ridge, Tennessee as a one-year USPHS Postdoctoral Fellow. Dr. Ewing received his Ph.D. from the University of Miami, Coral Gables, Florida.

Claudia Pellegrino completed a year's study with the Biochemical Radiation Group of the Oak Ridge National Laboratory on 3 November 1967. Dr. Pellegrino returned to his position at the Instituto di Patologia Generale, University di Sienna, Italy.

W. L. Mengebier has resigned as Head of the Department of Biology, Madison College, Harrisonburg, Virginia after a term of 14 years. Dr. Mengebier will return to full time teaching and research.

John Landry has been appointed Assistant Professor of Biology, Randolph-Macon Woman's College, Lynchburg, Virginia. Mr. Landry did graduate work at the University of Connecticut, specializing in vertebrate ecology, and comes to RMWC after a sojourn at the University of Utah.

Herbert P. Riley, Visiting Professor, Department of Population and Environmental Biology, University of California, Irvinc, attended the West Coast Population Biologist's Conference at Stanford University in November.

New faculty members of the Department of Biological Science, Florida State University, Tallahassee, are: Morton L. Burdick, Assistant Professor, Ph.D., The Johns Hopkins University (Developmental Biology); Pasquale Graziadei, Associate Professor, M.D., University of Pavia, Italy (Electron Microscopy); William F. Herrnkind, Assistant Professor, Ph.D., University of Miami (Animal Behavior); S. R. de Kloet, Associate Professor, Ph.D., University of Utrecht, The Netherlands (Biosynthesis of Proteins and Nucleic acids); and Charles R. Stasek, Associate Professor, Ph.D., University of California, Berkeley (Mollusca).

New Staff of the Department of Biology, Roanoke College, Salem, Virginia are **Harold S. Adams**, Lecturer in Biology, B.S., Eastern Illinois University, M.S., University of Omaha, Ph.D. candidate, Virginia Polytechnic Institute; **Doris Jean Dealy**, Assistant Professor of Zoology, Ph.D., Texas Woman's University (Bacteriology); **Gene Grubitz, III**, Assistant Professor of Biology, Ph.D., University of Arkansas (Animal Behavior); **Linna Ellen Hardin**, Research Assistant in Parasitology, B.A., Coker College, M.A., Vanderbilt University.

Tang Shih-chen Auyang, Professor of Biology, Taiwan Normal University, Taipei, Taiwan will be a Visiting Professor of Biology at Western Maryland College, Westminster, for the second semester, 1967-68 Session.

Howard M. Lenhoff, Director of the Laboratory for Quantitative Biology, University of Miami, Coral Gables, Florida, has been elected a Fellow of AAAS.

J. W. Longworth and **R. O. Rahn**, Biology Division, Oak Ridge National Laboratories, Oak Ridge, Tennessee, presented papers at the International Symposium on Basic Mechanisms in Photochemistry and Photobiology held in Caracas, Venezuela.

Alexander Hollaender, Biology Division, Oak Ridge National Laboratories, Oak Ridge, Tennessee, attended the December meeting of Organizing Committee of NAS which studied plans for the organization of a Health and Biological Planning Institute.

The chart series "Plants Poisonous to People" by **Julia Morton**, Director of the University of Miami (Florida) Collegetanea, has been adopted by the Walter Reed Medical Center in Washington to train medical officers for service in Southeast Asia.

Some changes in the staff of the Radiobiological Laboratory of the U. S. Fish and Wildlife Service, Beaufort, North Carolina, include: **E. N. Pettaway, Jr.**, temporary Biological Aid, resigned; **J. C. White, Jr.**, returned from a year of graduate study at North Carolina State University, Raleigh; and **R. B. Williams** began a year of training at Oak Ridge National Laboratory.

J. P. Baptist, Radiobiological Laboratory, U. S. Fish and Wildlife Service, Beaufort, North Carolina participated in the Second Consolidated Departmental Manager Development Program held in Washington, D. C.

Charles Boehms, Associate Professor of Biology, and **David Synder**, Assistant Professor of Biology, Austin Peay State University, Clarksville, Tennessee, led a group of 19 students on a 7-day study at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi.

D. A. Crossley, Jr., joined the staff of the University of Georgia, Athens, as Professor of Entomology. Dr. Crossley was formerly Insect Ecology Group Leader at Oak Ridge National Laboratory and Associate Professor of Zoology (Part-time) at the University of Tennessee.

David O. Tandle has been appointed Associate Professor of Forest Mathematics at Duke University, Durham, North Carolina. Dr. Tandle was formerly with the Southeastern Forest Experiment Station, Asheville, North Carolina. He will teach courses in forest statistics and operations research.

Fred M. Vukovich, Research Meteorologist, Engineering and Environmental Sciences Division, Research Triangle Institute, Durham, North Carolina, has been named Adjunct Professor of Forest Meteorology at Duke University. Dr. Vukovich will teach courses in atmospheric motion, turbulence and diffusion.

John Louis Gerin has joined the staff of the Molecular Anatomy Section, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Dr. Gerin was formerly with Abbott Laboratories, Chicago, Illinois.

Jimmy Barthel Jones has resigned from the staff of the Pathology and Physiology Section, Oak Ridge National Laboratory, Oak Ridge, Tennessee, to accept a position at the University of Tennessee Memorial Research Center, Knoxville.

Craig Allen has been appointed Assistant Professor of Biology, Shorter College, Rome, Georgia. Dr. Allen received his terminal degree in entomology from Clemson University.

Elton C. Cocke, Professor of Biology, Wake Forest University, Winston-Salem, North Carolina, has recently published a book on the Myxophyceae of North Carolina. The book is profusely illustrated and describes about 325 species of blue-green algae.

Ralph D. Amen, Associate Professor of Biology, Wake Forest University, Winston-Salem, North Carolina, assumed the duties of Chairman of the Department 1 July 1967. Dr. Amen succeeded Elton C. Cocke, who had been chairman since 1960.

Don G. Benson, Jr., has been appointed Assistant Professor of Zoology, Virginia Polytechnic Institute, Blacksburg. He was formerly at Louisiana State University, Baton Rouge.

William A. Calder, has been appointed Assistant Professor of Zoology, Virginia Polytechnic Institute, Blacksburg. He was formerly at Duke University, Durham, North Carolina.

Richard S. Mitchell, has been appointed Assistant Professor of Botany, Virginia Polytechnic Institute, Blacksburg. He received his Ph.D. from the University of California at Berkeley.

Robert A. Paterson, has been appointed Head of the Department of Biology, Virginia Polytechnic Institute, Blacksburg, Virginia. He was formerly at the University of Maryland, College Park.

Ernest R. Stout has been appointed Assistant Professor of Botany, Virginia Polytechnic Institute, Blacksburg. He was formerly a Public Health Service Post-doctoral Fellow at the University of Maryland, College Park.

About Institutions

The Department of Biology, **Southwestern at Memphis**, Tennessee, has received a NSF College Science Improvement Program grant of \$32,000 for the purchase of a tow vehicle and trailer, the latter to be equipped as a mobile environmental laboratory. The first extended trip with this new facility is planned to be to the southwestern United States in Summer, 1968.

New Trustees and Officers were elected at the October meeting of the **BioSciences Information Service (BIOSIS)**. Officers elected for a one-year term were **Arthur D. Hasler**, Director of the Laboratory of Limnology of the University of Wisconsin, Madison, President; **Norman E. Gibbons**, Assistant Director, Division of Biosciences, National Research Council, Ottawa, Canada, Vice President; **Karl H. Beyer, Jr.**, Senior Vice President, Research, Merck Sharpe & Dohme Research Labs, West Point, Pennsylvania, Treasurer; and **Allan H. Brown**, Chairman, Department of Biology, University of Pennsylvania, Philadelphia, Secretary. New Trustees elected for a three-year term were **Herbert H. Ross**, Assistant Chief of the Illinois State Natural History Survey, Urbana; **William C. Steere**, Director of the New York Botanical Garden, New York City; and **Dael Wolfe**, Executive Officer, American Association for the Advancement of Science, Washington, D. C. Continuing Trustees are **Theodore L. Jahn**, Professor of Zoology, University of California at Los Angeles, Immediate Past President; **Paul J. Kramer**, James

B. Duke, Professor of Botany, Duke University, Durham, N. C.; **James H. Oliver**, Director of the American Museum of Natural History, New York; **Phyllis V. Parkins**, Director, BioSciences Information Service; **Kenneth B. Raper**, Professor of Bacteriology and Botany, University of Wisconsin, and **F. W. Went**, Professor of Botany, University of Nevada, Reno.

In conjunction with the 40th Anniversary of the **BioSciences Information Service** and the dedication of their new headquarters building, BIOSIS presented a two-day international conference on world problems in Philadelphia in October. Speakers were Keynoter **Arthur Larson**, Director of the World Rule and Law School at Duke University, Durham, N. C.; **Sam Yorty**, Mayor of Los Angeles; **H. Bentley Glass**, Academic Vice President, State College of New York, Stony Brook; **Alan H. Nourse**, Author, Seattle, Washington; **Leon H. Sullivan**, Chairman of the Board, Opportunities Industrialization Center, Philadelphia; and **Irwin B. Berch**, Director, Philadelphia District, Food & Drug Administration. The full proceedings of the conference are being prepared for distribution early next year, and will be available for those interested.

Louisiana State University in Shreveport opened for its first session during the 1967-68 school year. The staff of the Department of Biological Sciences includes **Richard K. Spears**, Acting Chairman, formerly of Centenary College, Shreveport; **Bobby F. Dowden**, formerly of Mississippi State College for Women, Columbus; **Dorothy A. Hubble**, formerly of Byrd High School, Shreveport; and **Sylvia K. Goodman**, formerly of Bossier High School, Bossier City, Louisiana.

A two-day symposium on protein structure and function was held at the **University of Miami**, Coral Gables, Florida, 22-23 January 1968. Participants were **J. A. Rupley**, University of Arizona, Tucson; **G. M. Edelman**, Rockefeller University, New York City; **B. S. Hartley**, Laboratory of Molecular Biology, Cambridge University, England; **Feodor Lynen**, Nobel laureate of the Max Planck Institute, Munich, Germany; **R. Bruce Merrifield**, Rockefeller University; **H. A. Scheraga**, Cornell University, Ithaca, New York; and **William J. Whelan**, **Sidney W. Fox**, and **J. Frederick Woessner**, all of the University of Miami.

Eighteenth Annual Spring Wildflower Pilgrimage

April 25, 26, 27, 1968
Gatlinburg, Tennessee

Plan now to enjoy this colorful and informative event in the Great Smoky Mountains at the peak of the spring wildflower season.

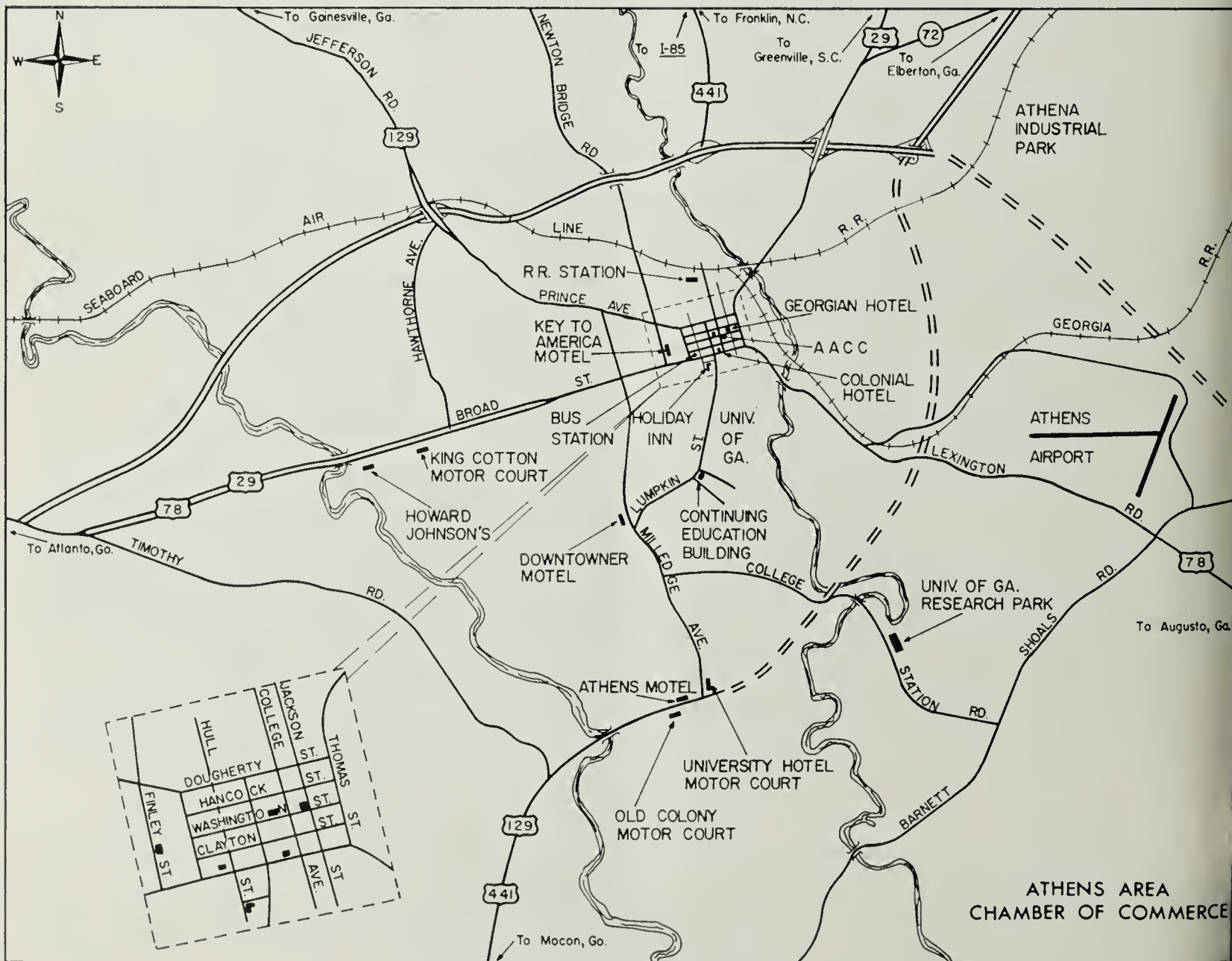
Each year this Wildflower Pilgrimage in the nation's most visited national park has grown in popularity. The Botany Department of The University of Tennessee, the Great Smoky Mountains National Park, and the Gatlinburg Garden Club join forces to prepare and conduct this program which is sponsored by The Gatlinburg Chamber of Commerce.

Motorcades and trail hikes under expert leadership take you to areas where spring wildflowers

grow in quantity and variety. Morning bird walks are featured each day.

Photographic tours, under experienced photographers, are also scheduled events of the Wildflower Pilgrimage. Each evening there are illustrated talks, plant clinics and a "coffee" social period. Those wishing to participate in the Wildflower Pilgrimage are urged to register in order to make arrangements for various pilgrimage trips and tours. Registration opens 9 a.m. Thursday, April 25, 1968, in the Gatlinburg Civic Auditorium. Registration fee is \$2. No advance registrations accepted. Detailed descriptions of each pilgrimage event are furnished each participant at the time of registration. Anyone who wishes to participate in the Nature Photographer's slide show on Saturday night should bring 10 of their best color slides.

If you wish a copy of the current Gatlinburg Accommodations Directory or other specific information, address Dept. W.P., Box 527.

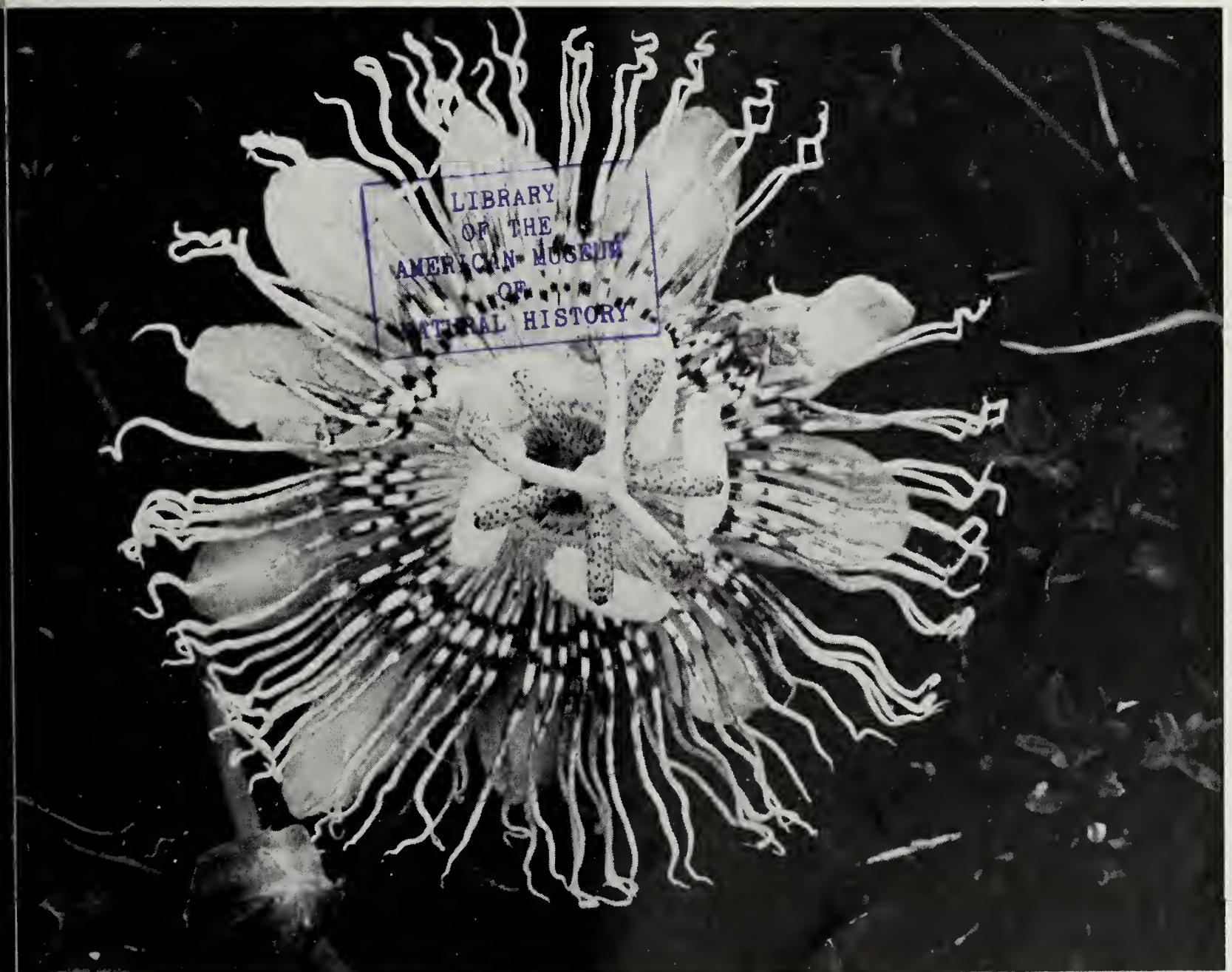


Map of the Athens, Georgia, Area

The ASB BULLETIN

Volume 15, Number 3

July 1968



Passiflora quadriangularis — The Passion Flower or May Pop

Clarence F. Styron

***The Official Quarterly Publication of
The Association of Southeastern Biologists***

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy L. Crandall, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Woman's College of Georgia, Milledgeville, Georgia. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Robert B. Short, Florida State University

Retiring President — Harold J. Humm, University of South Florida

President Elect — John M. Carpenter, University of Kentucky

Vice-President — John W. Hardin, North Carolina State University

Secretary — Dorothy L. Crandall, Randolph Macon Woman's College

Treasurer — David J. Cotter, Woman's College of Georgia

Executive Committee — Albert E. Radford, University of North Carolina; John D. McCrone, University of Florida; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

STATE CORRESPONDENTS

Alabama — Position Vacant

Florida — John D. McCrone, University of Florida

Georgia — Fred K. Parrish, Georgia State College

Louisiana — Harry J. Bennett, Louisiana State University

Mississippi — Joseph Fitzpatrick, Mississippi State University

North Carolina — C. J. Umphlett, University of North Carolina

South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College

Tennessee — Donald Caplenor, George Peabody College

Virginia — Harry L. Holloway, Jr., Roanoke College

West Virginia — Earl L. Core, West Virginia University

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman

CONTENTS

Association Affairs	66
Current Research on Vegetation in the Southeastern States	67
NSS Moves to Preserve Shelta Cave	76
Books and Periodicals	77
News of Biology in the Southeast	79

Passiflora quadriangularis, passion flower or may pop. This woody vine is abundant on the bunkers of the Emory University Gamma Radiation Field in Atlanta, Georgia.

ASSOCIATION AFFAIRS

The largest annual meeting in the history of ASB, and perhaps the most successful ever, was held at the University of Georgia's Continuing Education Center at Athens April 18 to 20, 1968. Over 1000 biologists attended (more than the total membership of ASB), although the paid registration record was somewhat fewer than 1000. There were 213 papers on the program, about 50 percent greater than the previous record number presented at the 1967 annual meeting.

Much credit for the attendance at this meeting and the number of papers should go to the organizations that met with ASB this year; the Southern Section of the American Society of Plant Physiologists, the Southeastern Section of the Botanical Society of America, the Southern Appalachian Botanical Club, the Southeastern Division of the American Society of Ichthyologists and Herpetologists, and the Southeastern Region of Beta Beta Beta National Honorary Biological Society. For the first time at an ASB annual meeting, there were paper sessions all day Thursday (those by the plant physiologists).

(Continued on page 74)

Current Research on Vegetation in the Southeastern States

A symposium co-sponsored by the ASB, the Ecological Society of America, the Society for the Study of Evolution, and Section G, AAAS — December 29, 1966.

Washington, D. C., AAAS Meeting

Arranged by Elsie Quarterman, Vanderbilt University

Session I

Introduction: ELSIE QUARTERMAN, Vanderbilt University.

The topography of southeastern United States is varied, including such diverse environments as those of the Everglades of Florida, the delta of the Mississippi River, granite and limestone outcrops, sand hills, mountain peaks, and coastal marshes. All of these areas have distinctive and in many cases unique vegetation. The floristic affinities of this region with southeast Asia and the several centers of endemism occurring in the southeast add to its ecological as well as its floristic interest, but the main concern of this symposium lies with the ecological or broad aspects of vegetation. I shall concentrate my brief introduction, therefore, upon a representative portion of the well-known, in many cases classical, work that provides the context into which the papers to be presented today will fit.

Perhaps more botanical attention has been focused on the southern Appalachians than on any other southeastern area of similar extent. Whatever may be their history as an ancient refugium for plant species, the southern Appalachians are a modern refuge, so to speak, for plant communities in stable or near-stable condition, the counterparts of which have been destroyed in surrounding areas. The ruggedness of the terrain and the presence of the Great Smoky Mountain National Park each contributes to the preservation of these invaluable remnants of vegetation.

Several papers have dealt with the whole complex of mountain vegetation, beginning with Harshberger in 1903. Later on, Davis (1930) studied the vegetation of the Black Mountains and Whittaker (1956) that of the Smokies. Whittaker's work proposed a pattern based largely upon moisture gradient analysis. In addition, E. Lucy Braun (1950) included an over-all coverage of the southern Appalachians in her book on the Eastern Deciduous Forest.

The spruce-fir forest of high elevations, which Shanks (1954) described as occurring in a microthermal rain forest climate, were first studied

quantitatively by Stanley Cain (1935), who was at that time very much involved with sampling methods, but whose more enduring contribution in this case, was the documented account of the spruce-fir forest itself. This forest is related to that of the northeastern states and southeastern Canada not only by its dominant species, but by many lesser floristic elements, as shown by Cain (1930) with reference to the higher plants and by A. J. Sharp (1939) for the bryophytes. In 1951, H. J. Oosting and W. D. Billings undertook an extensive comparison of virgin spruce-fir stands in the northern and southern Appalachians, and firmly established the ecological similarities of such forests in the two regions. Results of an extensive study of ground vegetation of the high elevation forest was published in 1958 by Dorothy Crandall, who designated 5 forest site types based upon variations in the undergrowth patterns.

Lower slopes of the mountains offer quite a different kind of ecological opportunity, in that one major dominant of the oak-chestnut forest that previously covered them (Braun, 1950) has been destroyed. The results of this catastrophic change have been studied in the Blue Ridge by Keever (1953) and in the Smokies by Woods and Shanks (1957). In both areas species of oak appear to be replacing chestnut, although insufficient time has elapsed for an equilibrium to have been attained.

According to E. Lucy Braun (1950), the cove-hardwood forests of the middle slopes are referable to the Mixed Mesophytic Association that is the key to the entire Eastern Deciduous Forest Formation.

Many questions concerning the origin and maintenance of the treeless grassy and heath balds of the Appalachians are still unanswered, although much information has been gathered about them by Camp (1931); Cain (1930; 1931); Davis (1931); Wells (1936; 1937); Brown (1953); Mark (1958); and Whittaker (1963). The local beech gaps, studied by Russell (1953), offer similar puzzles.

To review work on vegetation of the Piedmont region, one inevitably starts with the comprehen-

sive paper of Oosting (1942) on the plant communities of the Piedmont of North Carolina. This paper established the climax of the region as oak-hickory, and, together with Billings' study (1938) of old field shortleaf pine stands, described the now well-known pattern of old field succession. This work not only provided sound phytosociological data on the plant communities, but laid the foundation for many related studies dealing with the underlying causes of the patterns, such as those of Keever (1950) on causes of old-field succession, Borman (1953; 1956) and Woodwell (1958) on pine and sweetgum, and Bordeau (1954) on oak.

A special environmental complex occurring in the Piedmont is that of the granite rock outcrops. Oosting and Anderson (1939) described the plant successions on such outcrops in eastern North Carolina, and McVaugh (1943) indicated the unique floristic patterns and general vegetational characteristics of outcrops in the southeast as a whole. Present studies of granite outcrop vegetation center around those of R. B. Platt (Burbanck and Platt 1964), his colleagues, and graduate students, with emphasis on the outcrops occurring in Georgia and Alabama.

Limestone outcrops in the southeast also display unique vegetation. The greatest concentration of these occurs in middle Tennessee, where cedar glades support a vegetation that is strikingly different from that of the adjacent regions. Glade vegetation has been described by several authors, including Harper (1926) and Quarterman, who published results of quantitative studies of the cedar glade complex in 1950. Since that time, work in the glades has concentrated upon autecological studies of the cluster of endemics that occur there.

A review paper by Wells in 1942 was concerned with summarizing many papers on ecological problems of the coastal plain of the southeast, the physiographic region to which Wells, himself, devoted much attention, especially in the Carolinas. Other names associated with specific coastal plain segments must be mentioned: Roland Harper, in Georgia, Alabama, and northern Florida; John H. Davis, the chief authority on vegetation of all of peninsula Florida, and Pessin and Penfound in Louisiana and Alabama.

Interest in the vegetation of the Coastal Plain has revolved for some years around the ecological status of pine and hardwoods as regional dominants. The region has been given several vegetational designations, among them fire subclimax (Chapman, 1932; Garren, 1943), Southern Pine Forest (Shantz and Zon, 1924), Southeastern Evergreen Forest Region (Braun, 1950), Southern Mixed Hardwood Forest (Quarterman and

Keever, 1962), and Southern Mixed Forest (Kuchler, 1964). For the Tallahassee Red Hills Section, Gano (1917) and Kurz (1944) had considered the climax to be Beech-Magnolia. Quarterman and Keever (1962) studied the upland forests throughout the whole extent of the coastal plain and determined that successional trends are toward a hardwood climax, co-dominated by some 14 to 24 species including beech and magnolia, but certainly not dominated by these species. They consider the potential climax of the mexican uplands, which they have called the Southern Mixed Hardwood Forest, to be an association of the Eastern Deciduous Forest.

Papers dealing with the maritime strand were reviewed in 1954 by Oosting, including those dealing with effects of salt spray and with treeless and forested strands and marsh vegetation. Since that time, Bordeau and Oosting (1959) have studied the live oak forests of North Carolina, and Clair Brown (1959) the vegetation of the Outer Banks of North Carolina.

Hall and Penfound (1939a, 1939b, 1943) reported the composition and structure of cypress and gum swamps of southeastern Louisiana and southern Alabama; Wright and Wright (1932) described the habitats and vegetation of the Okefenokee, one of the largest of the southern swamps; Wells (1942) and Buell and Cain (1943) reported on *Chamaecyparis* swamps near the North Carolina coast; John Davis (1943), Frank Egler (1952) and C. M. Loveless (1959) on the Everglades; and Davis (1940) on the mangrove swamps of south Florida. For other work dealing with southern swamps and marshes, reference may be made to a review paper on that topic by Penfound (1952).

Radiation effects on vegetation have been and are being studied in three centers, the Emory University study area at Douglasville, Georgia, the University of Georgia Ecology Institute at the Savannah River Project near Aiken, S. C., and the Ecology Division at Oak Ridge, at all of which basic information on vegetation is being accumulated.

The papers now to be presented represent a sampling of work in progress today.

As with the sampling of vegetation itself, not all possible variations of research on vegetation are represented here — and a certain degree of clumping in distribution has inevitably skewed the sample away from complete geographic coverage.

Literature Cited

- Billings, W. D. 1938. The structure and development of old field shortleaf pine stands and certain associated physical properties of the soil. *Ecol. Monogr.* 8: 437-499.

- Bormann, F. 1953. Factors determining the role of loblolly pine and sweetgum in early old-field succession in the Piedmont of N. C. *Ecol. Monogr.* 23: 339-358.
- Bormann, F. H. 1956. Ecological implications of changes in photosynthetic response of *Pinus taeda* seedlings during ontogeny. *Ecol.* 37: 70-74.
- Bordeau, Phillipe, and Henry J. Oosting. 1959. The maritime live oak forest in N. C. *Ecology* 40: 148-152.
- Bordeau, Phillipe. 1954. Oak seedling ecology determining segregation of species in Piedmont oak-hickory forests. *Ecol. Monogr.* 24: 297-320.
- Braun, E. Lucy. 1950. Deciduous forests of Eastern North America. 596 pp. The Blakiston Co.
- Brown, Clair. 1959. Vegetation of the outer banks of North Carolina, Baton Rouge, Louisiana. 175 pp. State University Press.
- Brown, D. M. 1953. Conifer transplants to a grassy bald on Roan Mt. *Ecol.* 34: 614-616.
- Buell, M. F. and R. L. Cain. 1943. The successional role of southern white cedar, *Chamaecyparis thyoides*, in southeastern N. C. *Ecol.* 24: 85-93.
- Burbanck, M. P. and R. B. Platt. 1964. Granite outcrop communities of the Piedmont Plateau in Georgia. *Ecol.* 45: 292-305.
- Camp, W. H. 1931. The grass balds of the Great Smoky Mts. of Tenn. and N. C. *Ohio J. Sci.* 31: 157-165.
- Cain, S. A. 1930. Certain floristic affinities of the trees and shrubs of the Great Smoky Mts. and vicinity. *Butler Univ. Stud.* 1: 129-150.
- Cain, S. A. 1931. Ecological studies of the vegetation of the Great Smoky Mountains of North Carolina and Tennessee. I. Soil reaction and plant distribution. *Bot. Gaz.* 91: 22-41.
- Cain, S. A. 1935. Ecological studies of the vegetation of the Great Smoky Mountains. II. The quadrat method applied to sampling spruce and fir forest types. *Amer. Midl. Nat.* 16: 566-584.
- Chapman, N. H. 1932. Is longleaf pine a climax? *Ecol.* 13: 328-334.
- Crandall, Dorothy L. 1958. Ground veg. patterns of the spruce-fir area of the Smoky Mts. Nat'l Park. *Ecol. Monogr.* 28: 339-360.
- Davis, J. H., Jr. 1930. Vegetation of the Black Mts. of N. C.: an ecological study. *J. Elisha Mitchell Sci. Soc.* 45: 291-318.
- Davis, J. H., Jr. 1943. The natural features of southern Florida, especially the vegetation, and the Everglades. *Fla. Dept. of Conserv., Geol. Bull.* 25.
- Davis, J. H. 1940. The ecology and geologic role of mangroves in Florida. *Carn. Inst. Wash. Publ. No.* 517:.
- Egler, Frank E. 1952. Southeastern saline everglades vegetation, Fla., and its management. *Vegetatio* 3: 213-265.
- Gano, Laura. 1917. A study in physiographic ecology in northern Florida. *Bot. Gaz.* 63: 337-372.
- Garren, Kenneth H. 1943. Effects of fire on vegetation of southeastern U. S. *Bot. Rev.* 9: 617-654.
- Hall, T. F., and Wm. T. Penfound. 1939a. A phytosociological study of a *Nyssa biflora* consocieties in southeastern Louisiana. *Amer. Midl. Nat.* 22: 369-375.
- Hall, T. F., and Wm. T. Penfound. 1939b. A phytosociological analysis of a cypress-gum swamp in southeastern Louisiana. *Amer. Midl. Nat.* 21: 378-395.
- Hall, T. F., and Wm. T. Penfound. 1943. Cypress-gum communities in the Blue Girth Swamp near Selma, Alabama. *Ecol.* 24: 208-217.
- Harper, R. M. 1926. The cedar glades of Middle Tennessee. *Ecology* 7: 48-54.
- Harshberger, J. W. 1903. An ecological study of the flora of mountainous N. C. *Bot. Gaz.* 36: 241-58; 368-83.
- Keever, Catherine. 1950. Causes of succession on old fields of the Piedmont, N. C. *Ecol. Monogr.* 20: 230-250.
- Keever, Catherine. 1953. Present composition of some stands of the former oak-chestnut forest in the southern Blue Ridge Mts. *Ecol.* 34: 44-54.
- Kuchler, A. W. 1964. Potential natural vegetation of the conterminous U. S. (map). *Amer. Geogr. Soc. Spec. Publ. No.* 36.
- Kurz, Herman. 1944. Secondary forest succession in the Tallahassee Red Hills. *Proc. Fla. Acad. Sci.* 7: 1-100.
- Loveless, C. M. 1959. A study of the vegetation in the Florida Everglades. *Ecol.* 40: 1-9.
- McVaugh, Rogers. 1943. The vegetation of the granitic flat rocks of the southeastern U. S. *Ecol. Monogr.* 13: 119-165.
- Mark, A. F. 1958. The ecology of the southern Appalachian grass balds. *Ecol. Monogr.* 28: 293-336.
- Oosting, H. J. and L. E. Anderson. 1939. Plant succession on granite rock in eastern N. C. *Bot. Gaz.* 100: 750-768.
- Oosting, H. J. 1942. An ecological analysis of the plant communities of Piedmont, N. C. *Amer. Midl. Nat.* 28: 1-26.
- Oosting, H. J. and W. D. Billings. 1951. A comparison of virgin spruce-fir forest in the northern and southern Appalachian system. *Ecology* 32: 84-104.
- Oosting, H. J. 1954. Ecological processes and vegetation of the maritime strand in the southeastern U. S. *Bot. Rev.* 20: 226-262.
- Penfound, W. T. 1952. Southern swamps and marshes. *Bot. Rev.* 18: 413-445.
- Quarterman, Elsie. 1950a. Ecology of cedar glades. I. Distribution of glade flora in Tennessee. *Bull. Torrey Club* 77: 1-9.
- Quarterman, Elsie. 1950b. Major plant communities of Tennessee cedar glades. *Ecology* 31: 234-254.
- Quarterman, Elsie, and C. Keever. 1962. Southern mixed hardwood forest: climax in the southeastern coastal plain, U. S. A. *Ecol. Monogr.* 32: 167-185.

- Russell, Norman H. 1953. The beech gaps of the Great Smoky Mountains. *Ecology* 34: 366-374.
- Shanks, R. E. 1954. Climates of the Great Smoky Mountains. *Ecology* 35: 354-361.
- Shantz, H. L. and Raphael Zon. 1924. Natural vegetation. *Atlas of Amer. Agric.*, Pt. I, Sect. E. U.S.D.A.
- Sharp, A. J. 1939. Taxonomic and ecological studies of eastern Tennessee bryophytes. *Amer. Midl. Nat.* 21: 267-354.
- Wells, B. W. 1936. Andrews Bald: the problem of its origin. *Castanea* 1: 59-62.
- Wells, B. W. 1936. Origin of the Southern Appalachian grass balds. *Science* 83: 283.
- Wells, B. W. 1937. Southern Appalachian grass balds. *Jour. Elisha Mitchell Sci. Soc.* 53: 1-26.
- Wells, B. W. 1942. Ecological problems of the southeastern U. S. Coastal Plain. *Bot. Rev.* 8: 533-61.
- Whittaker, R. H. 1956. Vegetation of the Great Smoky Mountains. *Ecol. Monog.* 26: 1-80.
- Whittaker, R. H. 1963. Net production of heath balds and forest heaths in the Great Smoky Mountains. *Ecology* 44: 176-182.
- Woodwell, Geo. M. 1958. Factors controlling growth of pond pine seedlings in organic soils of the Carolinas. *Ecol. Monog.* 28: 219-236.
- Woods, Frank W. and Royal E. Shanks. 1957. Replacement of chestnut in the Great Smoky Mountains of Tenn. and N. C. *Jour. of Forestry* 55: 1 page.
- Wright, A. H. and A. A. Wright. 1932. The habitats and composition of the vegetation of Okefenokee Swamp, Georgia. *Ecol. Monog.* 2: 109-232.

ABSTRACTS OF PAPERS

1. *Distribution of Marine Algae Along the Coast of North America in Relation to Inshore Oceanographic Conditions.*

HAROLD J. HUMM, Queens College.

Inshore waters of continental North America in the western North Atlantic are populated by only two major geographical floral units. One of these originated and is centered in the tropics and its major inshore northern boundary appears to be in the vicinity of Cape Kennedy, Florida. The other originated and is centered in the cold-temperate waters of the North Atlantic and its major inshore southern boundary on the coast of North America is Cape Cod.

The long coastline between these two boundaries is a vast transition zone occupied either continually or seasonally by the more eurythermal elements of each major flora, for there are few, if any, species restricted to the transition zone. This zone of overlap of the two floras is readily divisible into several subzones bounded by temperature breaks related to coastal surface currents.

2. *Salt Marsh Vegetation of the South Atlantic Coast.*

ARTHUR W. COOPER, North Carolina State University.

Salt marshes of the South Atlantic Coast have been studied in sufficient depth so that the general aspects of their ecology are well understood. These marshes form behind barrier beaches or sea islands and are best developed in areas where major rivers deposit heavy silt burdens in estuaries. Characteristically, *Spartina alterniflora* Loisel., in three growth forms, dominates virtually all of the marsh below mean high water. Above this elevation, *Juncus roemerianus* Scheele and a group of "high marsh" species occur. Plant zonation in these marshes is closely correlated with variation in elevation, salinity, sediment texture, and drainage.

Studies of trophic structure of salt marshes in Georgia have shown the marsh and associated estuarine waters to be an inter-related system. Present studies are seeking to clarify details of marsh trophic structure and to determine the contribution of various estuarine producers to total estuarine productivity.

The history of sea level change is preserved in salt marsh sediments. The few data available are in agreement with other data and indicate a slowly rising sea level during at least the last 5000 years and suggests that present marsh vegetation and its successional relationships must be interpreted in this light.

Salt marshes are vital segments of the estuarine environment, providing food and shelter for many species of fish and shellfish at some time during their lives. The legal status of ownership of tidal marshes is vague in many states and in all states marshes are subject to increasing destruction. Efforts are underway in numerous quarters to develop effective means of marsh conservation. Knowledge of marsh ecology is forming the basis for these measures.

3. *Successional and Environmental Relationships of the Forest Vegetation of North Central Florida.*

CARL D. MONK, University of Georgia.

Seven major forest vegetation types exist in north central Florida: (1) southern mixed hardwoods, (2) mixed hardwood swamps, (3) bayheads, (4) sandhills, (5) sand pine scrub, (6) pine flatwoods, and (7) cypress swamps. The first three are climax communities on upland, wet fertile, and wet acid sites respectively. The latter four represent successional communities. With improvement of drainage or the elimination of fire, succession may proceed in a variety of directions.

The sandhills and sand pine scrub community types are fire maintained and are situated on sterile soils. Succession is always toward the Southern Mixed Hardwoods. The pine flatwoods are fire maintained and are located on poorly drained soils. With the release from fire succession may proceed toward either of the three climax communities. The direction of succession appears to be related to soil moisture and fertility. Cypress swamps are limited by flooding. With improved drainage they may be converted to mixed hardwood swamps or bayheads depending upon soil fertility.

4. *The Ecology of the Florida Pine Flatwoods.*

JOE ALLEN EDMISTEN, University of Georgia.

This study was designed to sample quantitatively the plants and soils of 32 stands of relatively undisturbed flatwoods in northcentral Florida. The objectives of the study included the following: (1) to establish successional trends with various periods of protection from fire; (2) to ascertain the associated edaphic changes and other ecological reasons for succession; (3) to obtain initial quantitative and qualitative differences in flatwoods types and the reasons for such differences; (4) to predict ultimate phytosociological compositions of flatwoods areas and rates of reaching this state of dynamic equilibrium.

In all stands sampled, pines were dominant by virtue of definition and selection. The sapling category was strongly invaded by hardwoods with years of protection. The disparity between the pine-dominated canopy and mixed hardwood understory is further exaggerated in the seedling class, where numbers of hardwood seedlings increased in logarithmic manner with years of protection.

The physical and chemical properties of the flatwoods soils changed also with years of protection. The average bulk density of the A₁ horizon was found to decrease with years of protection; the average moisture equivalent increased in the A₁ and A₂ horizons with years of protection due to incorporation of organic matter. Cation exchange capacity increased in a manner correlated with organic matter and moisture equivalent. The amounts of Ca and Mg, to a lesser extent, increased in the A₁ horizon in a manner correlated with the frequency of *Serenoa repens*, which suggests that saw palmetto acts as a nutrient "pump." As the importance value of *Myrica cerifera* increased, it was noted that in many cases there was a significant increase of NO₃ in the soil. It was noted also, that all pond pine stands occurred on soils having pH values from 3 to 4 and that root action on the organic hardpan located in most of the flatwoods soils resulted in a breaking up of the pan in many cases, and a more even profile of hydrolic conductivity was attributed to this.

In conclusion it may be said that when flatwoods are protected from fire, the vegetation shows a tendency to change from an open pine woodland to a closed hardwood forest composed of species from the more xeric sandhills and hammocks and the more hydric bayhead and swamp species.

5. *Multiresources Management of Coastal Plain Pinelands.*

J. B. HILMON, U. S. Forest Service.

An interdisciplinary team of six scientists is studying problems of integrating management of cattle forage and wildlife habitat with timber production in the slash-longleaf pine-wiregrass ecosystem. These researchers are determining effects of limited site treatments such as fire, mechanical disturbance, fertilization and cattle grazing intensities on multi-resource productivity in the commercial pine stands of the northern part of the type and on cutover and understocked lands in southern Florida. On a more limited scale, the opportunities for achieving optimum production on completely renovated sites are being studied. Examples of recent research will be presented to illustrate management opportunities. Solutions to these problems require autecological studies of key plants in the ecosystem, and these have been started for *Aristida stricta*, *Serenoa repens*, *Ilex glabra* and *Cassia fasciculata*. Tracts have been set aside on Florida National Forests where results of multiresource research can be demonstrated in typical management situations.

Session II

6. *Radiation Sensitivity of Four Ecosystems.*

J. FRANK MCCORMICK, University of North Carolina.

One aspect of vegetation study which is more strongly developed in the Southeastern United States than elsewhere is radiation ecology. The pioneering efforts of Emory University, the University of Georgia, and Oak Ridge National Laboratory provided base lines and stimulation for extension of these studies to the University of Tennessee, the University of North Carolina, the College of William and Mary, and Alabama College.

Recognizing that rarely has the intensity of any environmental factor increased so much in so short a time, studies of the ecological effects of ionizing radiation were initiated in the early 1950's. These investigations consist of descriptions of the structure and function of a variety of plant communities, analysis of damage produced by varying rates and doses of ionizing radiation, and descriptions of the recovery mechanisms and patterns of these communities.

In addition to descriptions of the comparative radiation sensitivities of a variety of natural communities, these experiments have demonstrated the usefulness of ionizing radiation as a research tool.

This report will include a summary of current radiation ecology studies in the southeastern states and comparisons of the radiation sensitivities of a variety of communities.

7. *Granite Rock Outcrop Endemics from the Standpoint of Speciation.*

WILLIAM H. MURDY, Emory University.

Granite outcrop communities, scattered throughout the southeastern Piedmont from North Carolina, have long served as sites for plant speciation. A few of the many species endemic to outcrop communities may be remnants of once more widespread species, which had their origin elsewhere. However, many endemic taxa have originated in relation to outcrop habitats; some by a gradual, eco-geographic process and others by an abrupt, saltational process.

The Piedmont region marks the geographic limit of distribution for many Coastal Plain and Appalachian species and the granite outcrops, with their variety of extreme habitats, provide an environmental challenge to which semi-isolated and marginal populations may respond through adaptive change. The neo-endemic, *Phacelia dubia* var. *georgiana*, which is well suited to open outcrop habitats, has recently evolved from the Appalachian *P. dubia* in the form of an ecotypic phase at the southern-most boundary of its range. *P. maculata*, now a relict endemic, probably had a similar origin in the remote past. Other endemic species have likewise evolved gradually, but from Coastal Plain species. *Rhynchospora saxicola* and *Portulaca smallii*, for example, occur at the boundary of the ranges of their putative, Coastal Plain progenitors, *R. globosa* var. *typica* and *P. pilosa* respectively. The occurrence of species pairs within outcrop communities, strikingly similar in life-form and ecology, but radically different in other important respects, suggests that saltational speciation has been involved in their origin. The widely fluctuating outcrop environment would be a significant factor in such a process. Examples of species pairs include: *Cyperus granitophilus*, an endemic species, and the less-polyploid, widespread *C. aristatus*; *Sedum pusillum*, a rare endemic, and the cytologically-distinct *Diamorpha cymosa* (*Sedum smallii*); and *Talinum mengesii*, confined to Alabama and a few stations in Georgia, and the florally-distinct, widespread *T. teretifolium*.

8. *Recent Vegetation Studies in Eastern Tennessee.*

E. E. B. CLEBSCH, University of Tennessee.

Recent vegetation research in eastern Tennessee has been carried out at several educational institutions and at Oak Ridge National Laboratory. Studies of floristic plant geography have been made of the Oak Ridge Region, The University of Tennessee Agricultural Research Experiment Station Arboretum, and Chilhowee Mountain. Forest stand inventories and the documentation of current vegetation in changing stands or stands expected to change have been made in grass and heath balds, on Chilhowee Mountain, and in Fraser fir stands threatened by balsam wooly aphid invasion. Several studies have explored the predictive value of site variables for stand characteristics and individual tree characteristics. The effects of annual and periodic controlled burning on floristics, vegetational characteristics, and soil properties of scrub oak barrens on the Highland Rim and entering their fifth year.

The independent and interacting variables of spruce-fir and beech vegetation on properties of soils formed from sandstone and slate in higher elevations of the Great Smoky Mountains are being evaluated. The highly valuable grass balds of the Smokies are being studied intensively with an eye to possible management for preservation. Inventories of dry matter and major plant nutrients in forest stands and estimation of circulation rates of macronutrients are continuing and being refined.

9. *Vegetation of the Highlands, North Carolina, Gorges.*

ARTHUR W. COOPER, North Carolina State University, Raleigh.

In southeastern North Carolina, between Hendersonville and Highlands, the Blue Ridge escarpment and drainage divide separate and a south-facing embayment, with diffuse topography and pronounced river gorges, known as the southeastern escarpment gorge region, is formed. This area has long been known to be of biological importance, being the type locality of *Shortia galacifolia* T. & G. and the site of a number of disjunct bryophytes and ferns. Recognizing the research potential of the southeastern escarpment gorge region, the Highlands Biological Station in 1961 sought from the National Science Foundation, and was awarded, support for a broad research program dealing with the biota and environment of the gorges. Early projects were primarily inventories but later studies have sought explanations of observed phenomena in studies of organism-environment interactions.

Although there are few data, the general character of the climate is known. The most obvious

feature of the region's climate is high rainfall. Annual mean values over the area range from 70-85 inches and annual means up to 100 inches appear to characterize certain of the larger gorges proper. Although soils of the area are poorly understood, the data available suggest that sola, particularly on south-facing slopes, have features associated with high weathering, such as low base saturation and high gibbsite mineral content in the clay fraction. These features are unexpected in view of the youthful topography in the gorges.

Vegetation has been studied in three of the gorges and in several tributaries. A *Riverbank Shrub Thicket* community, dominated by *Alnus rugosa* (DuRoi) Spreng., occurs along the banks of all rivers and major creeks. In floodplain areas which have been the sites of human dwelling and cultivation, a *Disturbed Floodplain Forest*, successional to some type of Mixed Mesophytic Forest, is found. The coves and lower protected slopes, primarily below 2200 feet, are covered with some type of *Mixed Mesophytic Forest*. In the cove segregate, there is a concentration of mesic species whereas in the slope segregate, where cove species occur with those more common on drier uplands, there is a greater richness of species. *Chestnut Oak Forest* occupies east and north-facing slopes at lower elevations but becomes more continuous at higher elevations. South- and west-facing slopes, particularly below 2500 feet, are characterized by *Mixed Oak and Hickory Forest*. Dry, open ridges are dominated by *Pine* or *Pine-Oak Forest*.

Numerous vascular plant taxa present in the escarpment gorges illustrate taxonomic problems of varying degrees of complexity. *Symplocos*, *Calycanthus*, *Tilia*, and *Acer rubrum* L. have been studied. Several projects dealing with species ecology also have been carried out. Two studies of the ecology of *Shortia galacifolia* have been completed. Habitat conditions and data from seedling ecology lead to the conclusion that *Shortia* is a plant of disturbed conditions and that it was more widely distributed during the warm, moist conditions of the Tertiary when more frequent erosion would have produced the temporary moss-covered substrates where seedlings could survive.

Several rather clearly defined distribution patterns of vascular plants are evident in the escarpment gorges. Two groups of species, one characteristic of the Coastal Plain and the other of the Piedmont and Coastal Plain, reach upper elevational limits in the gorges. A smaller group of species reach lower elevational limits. A number of Southern Appalachian endemics and species characteristic of Mixed Mesophytic Forest are present but several are conspicuously absent. Several species show disjunct distribution patterns with evidences of low and high elevation populations. In addition, a concentration

of bryophytes with remarkable disjunctions is also present.

Although much is known about the plant and animal life of the escarpment gorges, much remains to be discovered. Biologists with interests in the area are urged to undertake projects in the gorges.

10. *Some Studies of Forests of the Tertiary Hills of Western Louisiana.*

GEORGE WARE, Northwestern State College of Louisiana.

In progress are three projects involving ecological investigations of upland forests of western Louisiana. They treat: (1) composition of species-rich forests of pronounced slopes; (2) structural characteristics of ravine beech stands; and (3) the nature and distribution of blue-jack oak stands.

(1) In dissected areas of the Tertiary hills of western Louisiana, elevation differences between ravine bottoms and ridges approach 150 feet, and marked compositional differences among forests exist. Samples of woody vegetation in narrow horizontal bands have been utilized for indicating quantitatively the leading dominants and their closest associates. Ordered arrangements of importance values of species show compositional patterns from ravine to ridge-top.

(2) Occurrence of beech (*Fagus grandifolia* Ehrh.) on lower slopes of ravines is widespread in the Tertiary hills of Louisiana. With samples of beech stands near the margin of the beech range, it has been possible to show geographic variation in reproductive vigor.

(3) Natural restriction of blue-jack oak (*Quercus incana* Bartr.) to deep, coarse, upland sands may be observed in several areas of Louisiana. Studies show that woody-plant associates of blue-jack oak are few; however, longleaf pine (*Pinus australis* Michx.) commonly occurs with blue-jack, and ranges of the two species in western Louisiana coincide closely in sandy areas.

Concluding Remarks: ELSIE QUARTERMAN, Vanderbilt University.

As these papers have indicated, much research that is directed toward understanding and interpreting vegetation is under way in southeastern United States. Such information is important from the viewpoint of environmental management as well as of biological research. Some parts of our region are in wilderness condition, others are affected by 300 years of degrading utilization. If man is to progress toward making his environment more, not less, suitable for his own habitation, he needs to increase his knowledge of effects of various kinds of disturbance, of the capacity of vege-

tation for repair, and of the probable end-points of such repair.

There is a need to establish a frame of reference for studies of species origins, of species tolerances to all kinds of environmental stresses, of species productivity under different sets of conditions, and of species interrelationships that determine community composition and structure. Such a frame of reference comes from thorough phytosociological research. In the southeast there are large areas where vegetational description based upon quantitative studies is not currently available, and/or where more intensive work would

supplement, expand, or perhaps replace the existing concept of local vegetation.

It is hoped that the presentation of this symposium may serve to encourage continued study, both descriptive and interpretive, and to focus the attention of interested investigators upon geographic and substantive areas in which vegetational studies could be profitably undertaken in southeastern United States.

The ASB is grateful to AAAS, and to the other co-sponsoring organizations for their assistance in presenting this symposium.

(Continued from page 66)

Credit for the smoothness of the meeting, for its success and enjoyableness, goes to the Committee on Local Arrangements headed by Drs. Wilbur Duncan and Donald Scott. About 90 people of the University of Georgia were involved with the local arrangements committee or with the Continuing Education Center in planning and management of the meeting. In addition to the biological faculty, a large number of graduate students contributed to the task and a number of secretaries and others. The traditional banquet on Friday evening was arranged by Dr. Carl Monk. This delightful affair was followed by an address in the center auditorium by Past-President Elsie Quarterman whose discussion of her plant physiological research in Tennessee fascinated every kind of biological scientist in her large audience.

It is to the faculty, students, and staff of the University of Georgia who participated in meeting arrangements to whom every ASB member in attendance and every member of the societies meeting with ASB are profoundly grateful.

The exhibits were probably the most numerous and attractive of any ever set up at an ASB meeting, and the attention they received gratifying to the personnel of the firms represented.

The many excellent facilities of the Continuing Education Center, as well as its efficient operation, drew countless compliments. These facilities permitted the meeting to be concentrated in one relatively small area, despite its over-1000 attendance.

NEW OFFICERS

Newly-elected officers at the Athens meeting were: Dr. John Carpenter, president-elect; Dr. James Hardin, vice-president; Dr. David Cotter, treasurer; Dr. A. E. Radford and Dr. John McCrone members of the executive committee.

Dr. Madeline Burbank agreed to serve another three-year term as archivist, in which capacity she has rendered much valuable and time-saving

assistance to ASB officers and has provided a much-needed depository for ASB records. Members having materials of historical interest to ASB should send them to Dr. Burbank at the Department of Biology, Emory University, Atlanta, Georgia 30333, if they wish to have them kept in the archives. Which materials are kept is determined by Dr. Burbank.

PRESENT MEMBERSHIP

ASB probably has over 1000 members at this time, as Secretary Dorothy Crandall reported that there were 998 on April 18 (921 regular, 23 emeritus, 54 institutional). Many new memberships were received during the Athens meeting which have not yet been counted.

EMERTI

Nominated for emeritus membership were Dr. John Couch of the Department of Botany, University of North Carolina; Dr. Fred Emerson of the Department of Biology, Elon College; Dr. Clyde T. Reed of the Department of Biology of the University of Tampa. Election to emeritus status will be done at the October meeting of the executive committee at which time eligibility of those nominated will be determined. Members are urged to nominate ASB members who have retired from their regular duties and who have been members of ASB for at least the past ten years. Send your nominations to Secretary Dorothy Crandall, Randolph-Macon Woman's College, Box 278, Lynchburg, Virginia 24503.

DEATHS IN THE ASB FAMILY

The following members of ASB died between the 1967 and 1968 annual meetings: Dr. Robert E. Coker, Department of Zoology, University of North Carolina at Chapel Hill; Dr. Leonard Doerpinghaus, Department of Biology, Agnes Scott College; Dr. William C. Mobberly, Jr., Department of Biology, Northeast Louisiana State College; Dr. Gordon B. Woolcott, Southwestern College, Georgetown, Texas.

GOETHE TRAVEL AWARDS

Goethe travel awards assisted 21 graduate students in attending this year's annual meeting, according to past-chairman of the committee, Dr. C. J. Umphlett of the University of North Carolina at Chapel Hill. The ASB executive committee has authorized the use of up to \$500 from the treasury for continuation of these awards.

1969 ANNUAL MEETING

The 1969 annual meeting will be held at Memphis State University, Memphis, Tennessee. Dr. Carl D. Brown will serve as chairman of the local arrangements committee and will be assisted by Drs. Victor E. Feisal and Julian Darlington (of Southwestern at Memphis). Subsequent meetings will be held at the following institutions: 1970, Florida Southern College, Lakeland; 1971, University of Richmond, Virginia; 1972, Samford University, Birmingham, Alabama.

MERITORIOUS TEACHING AWARD

The winner of the Meritorious Teaching Award of ASB for 1968, Dr. Wade T. Batson, is a native of Marietta, South Carolina and a graduate of Furman University. He received the M.A. and Ph.D. degrees from Duke University. Since 1952 he has been on the faculty at the University of South Carolina, where he is now Professor of Biology. Dr. Batson's main scientific

interests are botanical taxonomy and ecology. He is highly regarded for his abilities as a teacher, both in the classroom and in the field.

RESEARCH PRIZE

The winners of the research prize, awarded annually by the Carolina Biological Supply Company, were announced by Drs. Charles E. Jenner and Anne B. McCrary. Their paper had been judged best by a committee at a northern university to whom all entries were submitted. At the time this announcement was made, the Research Awards Committee and ASB officers were unaware that Drs. Jenner and McCrary had not been able to present their paper orally at the meeting as required by the competition rules.

Accordingly, the Executive Committee, the Research Awards Committee, and Drs. Jenner and McCrary have agreed that the prize should go to the runner-up, Dr. Henry C. Aldrich of the University of Florida for his paper, "Ultrastructure of mitosis in myxamoebae and plasmodia of *Physarum flavicomum*."

WE NEED YOUR HELP

We can well appreciate a person's concern when mail is sent to him or her at a wrong address, and it is returned to the sender as undeliverable. We can also understand indignation at some error in an address: a misspelled name, a college called by a name that has been recently changed, or a street mistakenly called an avenue.

However, speaking from the standpoint of the sender—in this case of the ASB Bulletin—we would greatly appreciate your forbearance of the small addressing *gaffe* that occurs all too frequently in our list. If, through the good graces of an overworked Post Office and the ministrations of a kind Providence, the Bulletin actually *reaches* you with some degree of regularity, please accept it and overlook small mistakes that offend only the vanity—and not the Postmaster. We ask this because every time an address change is made it costs the ASB twenty-five cents. A seemingly small amount in itself, but one which adds up quickly with the average number of changes running over 200 per year—and the money could well be used for more worthwhile purposes than enriching the Addressograph Company.

The short-term address is a related matter, which also adds to the problem. If you are a graduate student, please try to give us a fairly permanent address (home?) so that we won't be changing your address plate two or three times a year. (Second class mail is not forwarded, but is returned to us with postage due of ten cents on each item, thus making *those* changes cost thirty-



WADE T. BATSON

five cents each.) If you are teaching, please give careful consideration to where the Bulletin should be sent, and try to stick by the decision. Some people are apparently subject to a yo-yo syndrome, and, according to our records, change

their addresses from home to school and back again fairly regularly. Remember, ASB dues are still among the lowest of any comparable society, and we need your help to keep them that way.

NSS Moves to Preserve Shelta Cave

The National Speleological Society, acting through the timely agency of the Nature Conservancy, has recently moved to preserve access to one of the world's truly unique underground ecosystems. A remarkable assemblage of animals lives in the groundwaters beneath the bustling streets of Huntsville, Alabama, and Shelta Cave, whose adjacent entrances lie on a lot between Link and Cave Streets just off the Pulaski Pike in this city, provides access to this unusual community. This lot recently came up for sale through an estate, and potential purchasers wanted to permanently seal the cave entrances to facilitate commercial development. In addition to cutting off access to this ecosystem for biologists, this action would have eliminated the colony of bats which inhabit the cave and probably drastically altered the ecological relationships to the detriment of the unique community. Thus, Shelta Cave became another in the unfortunately long list of examples of valuable natural areas threatened by urbanization. Preservation of this cave is of utmost importance, and has been undetraken.

Shelta Cave's major claims to distinction lie in the remarkable diversity of its troglobitic (cave-adapted) fauna and the fact that it is the type locality for nine species of cave animals, two of them apparent endemics. It will also be the type locality for other forms not yet described. It probably contains more kinds of major aquatic troglobites than any known cave in the world, and its terrestrial fauna is also quite rich. Thus, it offers for study an ecosystem in which the environmental parameters are reduced and yet where the maximum community complexity attainable in such a deprived environment may well be represented. In addition to its potential as a natural ecological "laboratory" and its value as a multiple type locality, the cave is also a marvelous nature preserve. It is one of but a few

caves known to house three distinct species of troglobitic crayfishes, one of them an as-yet undescribed endemic, and is the type locality for one of the others. It also harbors a population of the endemic cave shrimp, *Palaemonias alabamiae*, one of only two known troglobitic atyids. Other aquatic troglobites in Shelta include the fish *Typhlichthys subterraneus*, the salamander *Gyrinophilus pelleucus*, an undescribed flatworm, and an undescribed amphipod. In addition to its aquatic fauna, Shelta contains at least nine species of terrestrial troglobites—three cave beetles, a snail, a pseudoscorpion, a millipede, a spider, a dipluran, and an undescribed thysanuran. It is the type locality of six of these animals, as well as of the non-troglobitic isopod, *Miktoniscus alabamensis*. In all, counting non-troglobites but not microscopic forms or parasites, the cave houses populations of over forty species of animals.

In addition to research programs, educational tours involving the local community and various school groups are envisioned as part of the program for use of the cave. The Huntsville Chapter of the National Speleological Society will serve as custodian of the cave and administer it according to policies established by the Society's Research Advisory Committee and Nature Conservancy.

Further information on the Project may be obtained from John E. Cooper, Department of Zoology and Institute of Speleology, University of Kentucky, Lexington, Kentucky 40506.

The National Speleological Society needs the help of all biologists, conservationists and other concerned persons in its campaign to *Save Shelta Cave*. Its immediate goal is to raise \$10,000. Tax-deductible contributions may be sent to: "The N. S. S. Shelta Cave Project," 2318 N. Kenmore Street, Arlington, Virginia 22201.

Books and Periodicals

COMPREHENSIVE BIOCHEMISTRY. Vol. 22: Bioenergetics. Vol. 27: Photobiology, Ionizing Radiations. Ed. by M. Florkin, and E. H. Stotz. American Elsevier Publishing Company, Inc., N. Y. vol. 22: 214 p., 1967, \$12.75. vol. 27: 384 p., 1967, \$20.00.

These two volumes are in Section V — Chemical Biology of the treatise. This section attempts to analyze the biochemical mechanisms of selected biologic processes. The notion that *all* biologic phenomena can be reduced to physicochemical principles appears to be promulgated in these volumes. A cursory examination of the nature of the topics and the way in which they are analyzed gives some credence to this notion. This may be disturbing to many organismic biologists, however, some crucial biologic issues are not convincingly dealt with, to wit: molecular regulation. Such questions as: what factors determine the positioning of molecular complexes receive little, even speculative, attention.

The volume on Bioenergetics includes treatment of: Quantum Biochemistry: Mechanisms of Energy Transfer; Chemical Transfer in Biology (a. Donor-acceptor Complexes in Solution, b. Transfer of Charge in the Organic Solid State); and Active Transport and Ion Accumulation. Several of these papers present a rather quantitative analysis, however, the degree of correspondence between the theoretical calculations and in vivo observations is weak at best. Not only are biologic molecules complex in their quantum relations, but in vivo molecular complexes are unbelievably elusive. Although the descriptive statement concerning the energy relations of molecular complexes are interesting, an examination of how such complexes originate and how their functions are regulated would be of greater interest to the biologist.

The volume on Photobiology covers the traditional areas of the subject: Phototropism; Biochemistry of Visual Processes; Bioluminescence; Photosensitization; The Effects of Ultraviolet Radiation and Photoreactivation; Phytochrome and Photoperiodism in Plants; Photosynthesis; and Effects of Ionizing Radiations in Biological Macromolecules. The last chapter, a topic not generally included in photobiology, is particularly welcome. Although the topics of photobiology naturally center on the photoresponses of plants, I feel the editors were remiss in not including a chapter on animal photoperiodism. The material presented in this volume is not particularly illuminating and is covered substantially in this form in a number of other volumes, but as the editors point out in their preface — there is some justification for having all this information "conveniently" placed in one series of books.

The volume on Bioenergetics appears to be more biophysical than biochemical in nature, and although of potential interest to biochemists it will probably not find wide audience among biologists per se. The other vol-

ume on Photobiology, however, should gain wide acceptance among biologists. The reason for this may be due, in part, to the fact that the papers on photobiology were authored mostly by biologists rather than by biophysicists or biochemists. For the biologist, sufficient bioenergetic detail is presented in the volume on Photobiology so as to make the volume on Bioenergetics unnecessary.

As with other volumes in this series, these are superbly bound, well printed, and overpriced. — RALPH D. AMEN, *Wake Forest University*.

THE SCIENCE OF MOVEMENT. R. A. R. Tricker and B. J. K. Tricker. American Elsevier Publishing Co., New York. 1967. 284 pp. \$9.00.

A simple account of the physical basis of movement is extended to motion of organisms. The authors use an experimental rather than a mathematical approach to emphasize practical relevance of the science of movement, thereby avoiding excess mathematical abstractions.

Biological aspects of balance and the action of muscle are discussed in two early chapters. Eleven of 21 chapters mainly concern mechanics under such headings as Hydrodynamics, The Role of Friction in Movement, and Rotation. Principles are then extended to movement by organisms in chapters Movement on Land, Movement in Water, Bird Flight, and Rotational Coordination. Four concluding chapters use athletics as a common ground for uniting basic mechanics with biology. Six brief appendices offer mathematical details for selected topics such as arrangement of fibers in muscle and the period of swing of a pendulum.

Depth of treatment of biological topics varies. Muscle physiology is discussed in detail, while movement in water receives superficial attention. Serious students will be dismayed to find no literature cited nor suggestions for further reading.

Illustrations fill 40 percent of the book. The 141 photographs in 97 plates are of mediocre quality; careful editing could have eliminated many of them. There are 130 clear, instructive graphs and drawings. However, half of them are untitled, which demands careful reading of the text in order to grasp the significance of the figures.

Physical education teachers will especially appreciate this book. However, application of Newtonian mechanics to ordinary situations met in everyday life will interest a general reader. A biologist with little training in mathematics and physics, who desires to understand movement, will find this book unusually informative and enjoyable. — DALE HEIN, *Wake Forest University*.

RESEARCH IN PROTOZOOLOGY, Vol. 1, Edited by Tze-Tuan Chen. 1967. Pergamon Press. 429 pp. \$17.00.

The objective of this four volume series is to review all major discoveries in protozoology made in the last 25 years and to relate these to earlier ones. In view of the diversity of publications in which research of interest to microbiologists may be found as well as the sheer volume of papers now appearing, this is a worth-while and long needed effort. As the interests of ever larger numbers of those in the life-sciences become increasingly interdisciplinary, we find ourselves ever more dependent on such volumes as this. One hopes that revisions will appear with regularity.

Volume 1 contains five review papers: "Cytoplasmic Organelles and Inclusions of Protozoa" by Everett Anderson; "Motile Behavior of Protozoa" by Theodore L. Jahn and Eugene C. Bovee; "Respiratory Metabolism" by William F. Danforth; "Contractile Vacuoles, Ionic Regulation, and Excretion" by J. A. Kitching; and "Nutrition and Growth of Protozoa" by R. P. Hall.

The largest of these articles is the 160 pages (total Vol. 1, pages 429) by Jahn and Bovee. It has 1005 references including many recent citations from Japanese and other journals probably not easily available to every protozoologist. The authors have not merely summarized the literature cited but have digested, integrated, and related the information into a meaningful and informative whole.

All of the authors have accomplished wonders by providing the essence of research accomplishments in their respective fields as well as the necessary references for a study in greater depth. Review articles of this caliber undoubtedly contribute much to the advance of science and may, in fact, be essential to the development of meaningful interdisciplinary research programs.

Volume 1 of *Research in Protozoology* should be in all life science libraries. I also recommend it to anyone interested in biology. It provides the background needed to understand research advances not treated in depth in most texts. The price is a bit high but so is the information content per page.—JOHN CAIRNS, JR., *Department of Zoology, University of Kansas*.

DIRECTORY OF BIOSCIENCE DEPARTMENTS IN THE UNITED STATES AND CANADA. AIBS Office of Biological Education, J. David Lockard, Director. Reinhold Publ. Corp., New York. 1967 Paper. 672 + xvi pp. \$8.50

This book is, as the name implies, a directory of the staff, course offerings, and degree programs available at most degree granting institutions in the United States and Canada. Field stations and laboratories associated with academic institutions and 300 non-degree granting institutions are also listed. Junior college offerings are, in general, not listed. Conspicuous by their absence,

however, are certain field stations which offer course work and graduate training; for example, Woods Hole Biological Laboratories and Scripps Oceanographic Institute. Although the Contents page lists three "Section", I consider that there are really four: (1) alphabetical listing of institutions; (2) descriptions of departments, alphabetically by state; (3) lists of non-degree granting institutions; and (4) alphabetical list of faculty members. Information was compiled from materials supplied by the respective departments and/or institutions. As one would expect, the listings, particularly of junior staff, are already out of date, but this does not seriously impair use of the directory if one is aware of this problem. The book will probably be of most use to advisors, including high school counsellors, in assisting students to choose a proper place for undergraduate or graduate training. The directory should be on the shelf of every bioscience department, advisor and library reference room. Hopefully, it will be revised periodically and with a potential sale of over 2,000 copies, this could be done and the price retained at its current reasonable level.—JFF.

THE DICTIONARY OF THE BIOLOGICAL SCIENCES. Peter Gray. Reinhold Publ. Co., New York. 1967. 602 + xx pp. \$14.75

Peter Gray's effort is another in the recent series of biological dictionaries which the different publishers are offering to the market. It contains (by the publisher's count) more than 40,000 entries and a four page list of the principal works consulted. Most of the definitions one would wish are included, restricted highly technical terms excepted. There are numerous instances, however, where the author's rationale is not clear or the definition is in need of refinement. Likewise, one can expect some frustration in locating certain terms unless one consults the Introduction. For example, Gray accepts the ordinal ending, "-iformes", for birds but does not for fishes although, to the best of my knowledge, most ichthyologists do. Likewise, he prefers the purist "foetus" over the more commonly used "fetus." The word "fiber" has a number of meanings when applied to muscles which often confuse a student; the dictionary does not present the different meanings, the only specialized definition given being "myofibril." A number of words are listed under the root stem; for example, a large number of entries are made under "-phyll-" and under "-therm". Under the latter, I find "poikilotherm" defined as "an animal whose body temperature varies according to the environment"; I spend considerable time trying to emphasize to my students that the differences between these animals and homiotherms are in intrinsic physiological mechanisms and behavior, rather than in direct response to environmental factors. Another instance of a shortcoming is the definition of "Peyer's patches" which are "=lymph follicle". Do I look for these in the head or the foot, or where? Many

mutant genes are listed, especially of insects, but I wonder if those interested in these details should not know these without consulting the dictionary. The practice of listing chemical terms, especially enzymes, under their root word such as "esterase" strikes me as desirable. Here the student is impressed with the basic similarities of action, rather than the specific action. Ecological and genetic terms, in general, are well-defined, as is also the case for many vernacular names

for organisms. Absent from Grey's list of consulted works are the commonly used laboratory manuals for elementary courses. I hope that in future additions Dr. Grey will search these for terms which may be unknown to a beginning student. In short, the dictionary is no better and no worse than recent similar efforts. It is, however, cheaper which gives it some attractiveness. —JFF.

News of Biology in the Southeast

Joseph F. Fitzpatrick, Jr. — Editor

About People

The News Editor regrets to report the death on 3 January 1968, after a lengthy illness, of **William C. Mobberly**. Dr. Mobberly was Associate Professor of Biology at Northeast Louisiana State College, Monroe. He received a bachelor's degree in pharmacy from Auburn University, a bachelor's degree in zoology from Huntingdon College, and a M.S. and Ph.D. in Zoology from Tulane University. He was a recognized authority in crawfish hormones.

Takashi Makinodan, Biology Division Oak Ridge National Laboratories, Tennessee, delivered two invited lectures to the Instituto Venezolano de Investigaciones Cientificas, Caracas, Venezuela on 18-20 January 1968.

Catherine Tehernigovtzeff of the Centre National de la Recherche Scientifique, Faculte des Sciences, Laboratoire de Zoologie, Paris, France, has joined the Biophysics Group of the Biology Division of Oak Ridge National Laboratory, Oak Ridge, Tennessee, for a three-month tour.

W. A. Arnold and **R. M. Pearlstein**, Biology Division Oak Ridge National Laboratories, Tennessee, attended the II International Conference on Photosensitization in Solids at Tucson, Arizona. Dr. Arnold acted as chairman of a session and Dr. Pearlstein presented an invited paper.

Alexander Hoellander, Biology Division, Oak Ridge National Laboratories, Tennessee, spent much of the month of February in travel. He attended the meeting of the Editorial Board of *Science* in Washington, presented a paper to the German Biophysical Society in Berlin, and attended the Cold Spring Harbor Directors' meeting in New York.

Vienzo Covelli left the Biology Division, Oak Ridge National Laboratories, Tennessee, on 5 February to return to his position at the Comitato Nazionale per l'Energia Nucleare, Rome, Italy.

The editor regrets to report the death of **S. Leonard Doerpinghaus** in an automobile accident occurring on January 19, 1968. Dr. Doerpinghaus received his terminal degree at Louisiana State University, Baton Rouge, and taught at Texas Lutheran College and L. S. U. before joining the staff of Agnes Scott College, Decatur, Georgia. At the time of his death, he was Associate Professor of Biology.

Robert J. Hurley has been appointed first permanent Chairman of the Division of Graduate Studies in Marine Sciences, University of Miami, Florida. Dr. Hurley has been a senior member of the staff of the Institute of Marine Sciences since 1961, and he has just returned from a one-year leave of absence during which he served as Deputy Director of the UNESCO Office of Oceanography in Paris.

Karen E. Buekton has left the Mammalian Cytology and Genetics Section of the Biology Division of Oak Ridge National Laboratory, Tennessee, after a one-year visit. On February 21 she returned to her position at the Medical Research Council, Western General Hospital, Edinburgh, Scotland.

Herbert S. Schwartz, formerly senior scientist with the Sloan Kettering Institute and Associate Professor in the Department of Pharmacology at Cornell University, has been appointed Professor and Head, Department of Biology, The University of Alabama, University.

John L. Mego, formerly Medical Research Chief at the Baltimore City Hospital and a member of the faculty at the Johns Hopkins University, has been appointed Associate Professor of Biology, University of Alabama, University. He is currently a National Academy of Science Fellow to Czechoslovakia and will join the staff September 1.

Helen Gill Sellin has joined the staff of the Enzymology Group of the Biology Division of Oak Ridge National Laboratories, Tennessee. She was awarded the Ph.D. by the University of Chicago.

A large expansion of the Biology Department staff of the College of William and Mary, Williamsburg, Virginia, has brought six new people to the campus during the past year: **Martin C. Mathes** (Ph.D., U. Maryland), a plant physiologist, came from the University of Vermont; **Jarid Simons** (Ph.D., Yale U.), an embryologist came following a post-doctoral fellowship at Yale; **Webster van Winkle** (Ph.D., Rutgers, the State U.) joined the faculty following completion of his degree in invertebrate physiological ecology; **Stewart A. Ware** (Ph.D., Vanderbilt U.) came following his degree which was awarded in Plant Ecology. Besides these who came in 1967, two others joined the staff in September, 1968: **Bradner Coursen** (Ph.D., U. Maryland), a student of fungal development and physiology, came from Lawrence University, Appleton, Wisconsin, and **Bruce Grant** (Ph.D., North Carolina State University, Raleigh) comes following his degree in population genetics and evolution.

Rudolph Prins, formerly at Clemson University, South Carolina, will teach this summer at the University of Oklahoma Biological Station at Lake Texoma. This fall he will join the staff of Western Kentucky University, Bowling Green, as Associate Professor of Biology.

Kai-Lin Lee, a recent graduate of Tulane University, New Orleans, Louisiana has joined the staff of the Biochemical Regulation Group, Biology Division, Oak Ridge National Laboratories, Tennessee.

James M. Collins has joined the Biochemistry of Cell Differentiation Group, Biology Division, Oak Ridge National Laboratories, Tennessee. He is a recent Ph.D. of the University of Tennessee, Knoxville.

Eugene P. Odum, Alumni Foundation Professor and Director of the Institute of Ecology, University of Georgia, Athens, has been named "Georgia's Scientist of the Year" for 1967 "in recognition of his contributions to the field of ecology" by the Georgia Science and Technology Commission.

Gary Dillard, formerly of Clemson University, South Carolina, will join the staff of the Department of Biology, Western Kentucky University, Bowling Green, in September.

New faculty members at East Carolina University, Greenville, North Carolina, are: **Wendell E. Allen**, Assistant Professor (Ph.D., Bacterial Genetics), University of Kentucky; **Takeru Ito**, Professor (Ph.D., Biochemistry), University of California, Berkeley; **Linda W. Little**, Assistant Professor (Ph.D., Environmental Microbiology), University of North Carolina, Chapel Hill; **James S. McDaniel**, Assistant Professor (Ph.D., Parasitology), University of Oklahoma; and **Susan G. McDaniel**, Assistant Professor (Ph.D., Ecology), University of Oklahoma.

R. A. Brown, Radiation Immunology Group, Oak Ridge National Laboratory, Tennessee, is on detached assignment to the Puerto Rico Nuclear Center, San Juan.

R. F. Kimball, Biology Division Oak Ridge National Laboratories, Tennessee, was in Europe 27 May through 11 June where he attended numerous conferences, meetings and seminars.

R. C. Fuller, Biology Division, Oak Ridge National Laboratories, Tennessee, presented a paper at the plenary session of the First International Congress of Photosynthesis, Freudenstadt, Germany, June 2-8. Following, he attended a conference at the University of Wales, Cardiff, and then presented a paper at the International Conference on Photosynthesis in Susan Cane in London. He returned to the laboratory on 17 June.

Ugo Del Monte, who has been with the Enzymology Group, Oak Ridge National Laboratory, Tennessee, recently returned to the University of Florence, Italy, in the capacity of Assistant Professor.

Dona C. Hooper left the Radiation Immunology Group, Oak Ridge National Laboratory, Tennessee, to continue her postdoctoral training in the laboratories of Frederick Becker, Associate Professor of Pathology, New York University Medical School.

About Institutions

An electron microscope laboratory has been established in the Department of Biology, **University of Alabama**, University. **Temd R. Deason**, Associate Professor of Biology, has been appointed director of the facility.

An Advanced Seminar in Tropical Botany was offered 17 June-26 July by the **University of Miami** (Florida). Seminar coordinator was **Taylor Alexander**, Professor of Botany. Other regular faculty were **Richard A. Howard**, Arnold Professor of Botany and Director of the Arnold Arboretum, Harvard; **Howard J. Teas**, Professor of Biology, Miami; and **P. B. Tomlinson**, Research Scientist at Fairchild Tropical Garden and Adjunct Assistant Professor of Botany, Miami. Several other specialists in related fields presented evening lectures.

Florida Technological University, Orlando, will accept its first students (freshmen and juniors) in September. Head of the Department of Biological Sciences will be **Leslie L. Ellis**, who formerly was Head of the Department of Zoology at Mississippi State University. Other staff are: **George E. Allen** (Ph.D., Mississippi State University), Associate Professor, insect pathology and virology; **Marshall J. Mann, Jr.** (Ph.D., Texas A & M University), Assistant Professor, cytology; **Richard E. Tandy** (Ph.D., Louisiana State University), Assistant Professor, invertebrate zoology; **Henry O. Whittier** (Ph.D., Columbia University), Assistant Professor, cryptogamic botany.

The ASB

LIBRARY
OF THE
AMERICAN MUSEUM
OF NATURAL HISTORY

BULLETIN

Volume 15, Number 4

October, 1968



Geolycosa, wolf spider

Clarence E. Styron

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy L. Crandall, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Georgia College, Milledgeville, Georgia 31061. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa. Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President -- Robert B. Short, Florida State University
Retiring President -- Harold J. Humm, University of South Florida
President Elect -- John M. Carpenter, University of Kentucky
Vice-President -- James W. Hardin, North Carolina State University
Secretary -- Dorothy L. Crandall, Randolph Macon Woman's College
Treasurer -- David J. Cotter, Georgia College
Executive Committee -- Albert E. Radford, University of North Carolina; John D. McCrone, University of Florida; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman



CONTENTS

Association Affairs	82
A Home in the Sun -- by J. Albert Starkey	83
West Virginia's Best Known Oak Tree	87
News of Biology in the Southeast	88
Books and Periodicals	92

ASSOCIATION AFFAIRS

ASSOCIATION RESEARCH PRIZE

If you intend to present a paper at the annual meeting of the Association of Southeastern Biologists, we wish to call your attention to the Association Research Prize and invite you to submit your manuscript in competition. This prize of \$100. is sponsored by the Carolina Biological Supply Company, Burlington, North Carolina. Rules and regulations are as follows:

1. The Research Prize is to be awarded for an especially meritorious paper actually presented by the author(s) at the annual meeting.

2. Only members are eligible to submit papers in competition for the research prize. This applies to all names on the submitted paper.

3. Papers submitted in competition may be in press but must not have been published prior to March 1 of the year of the current competition.

4. Papers submitted in competition are judged by eminent scientists in the various fields of biology. These individuals are selected by the Research Committee and are from schools outside the Southeast. Every effort is made by the Re-

(Continued on page 86)

A HOME IN THE SUN

J. ALBERT STARKEY¹

Isolated occurrences of Allegheny Mound Ants have been able to remain unrecorded in such an unlikely area as Southern New Jersey. They are far from their typical homeland in the Allegheny mountains, and are known in New Jersey only in the northern part of the state. Dwellers of the forest, they remain undisturbed unless the forest is destroyed.

There are at least two separate colonies of the ants in the eastern end of Cumberland County, and I have observed one of them for a period of thirty years. This is the principal colony, and occupies an area of fifty acres.

The forest is deciduous, principally oaks, with a sprinkling of pitch pines. The oaks range up to 62 inches in circumference. Two oaks tested with an increment borer show a ring count of 60 ± 2 years. The type of growth of the trees indicates that the area was probably never cleared for farming, but represents a regrowth after having been cut over for the wood. Earlier cutting was done for both charcoal and lumber, and two saw-mills operated within a mile of this site.

The soil is gravelly, part of the Bridgeton formation of the Quaternary period. The land is slightly rolling, the elevation varying from 70 to 90 feet above sea level, and the ant mounds are distributed over the entire 50 acres (except in the lower spots which are normally damp). Although all the forest appears to be of the same age, there are more old and abandoned mounds in the eastern section. There has been an apparent westward movement of the ant population.

Individual mounds are located in roughly circular areas free of trees for a 60 to 75 foot diameter. After a number of these locations are studied, a pattern becomes evident. If the forest canopy is open above the treeless area, there will be an active mound. If the canopy is closed, the mound, if present, will have been abandoned.

This combination of opening, sunlight, and ant activity is so typical that it is necessary only to travel through the forest looking for areas where there is a large patch of sunshine on the ground. In all probability, there will be an active mound near the center of the area. In a few instances there are two mounds; one in the sunshine, one in the shadow. As the canopy began to close over and shadows spread over the mound, the ants gradually shifted their activity and developed a new mound, a few feet away, in the remaining sunshine. In some instances where the canopy has closed over completely, the circular area is still obvious and investigation may show a long abandoned mound. Enough time may have elapsed so that the mound is now covered with the shrubs of the forest floor.

The area within the circle of trees, in all cases, is covered with low shrubs, mostly *Gaylussacia sp.* and *Vaccinium sp.* The ants apparently have had no effect on the growth of the shrubs except in the immediate area of the mound, which is never overgrown if it is in use by the ants. There are some places in which the shrubs have achieved better growth in the circles around the ants than in the nearby forest. Undoubtedly sunlight, the factor which favors the ants, also encourages the plant growth.

¹ Head, Science Dept., Vineland Senior High School, Vineland, New Jersey 08360.

Twenty years ago there were several mounds along the edge of the forest and along an open trail through the interior. The growth of the forest since that time has placed those same mounds in the shadows and they have been abandoned.

An interesting secondary use of two abandoned mounds is their development into fox burrows. One mound has two tunnels leading toward the central section from opposite sides, however, there is no evidence of current use.

There are mounds in all stages of development and abandonment. Some are so old that there has been considerable subsidence and only a few inches of elevation remains. Many are completely covered with the common shrubs of the forest. An apparent typical development is the growth of a patch of trailing arbutus, *Epigaea repens*, on abandoned mounds. Some are more or less completely covered with moss, identified as *Polytrichum ohioense*. This same moss also partly covers many of the active mounds.

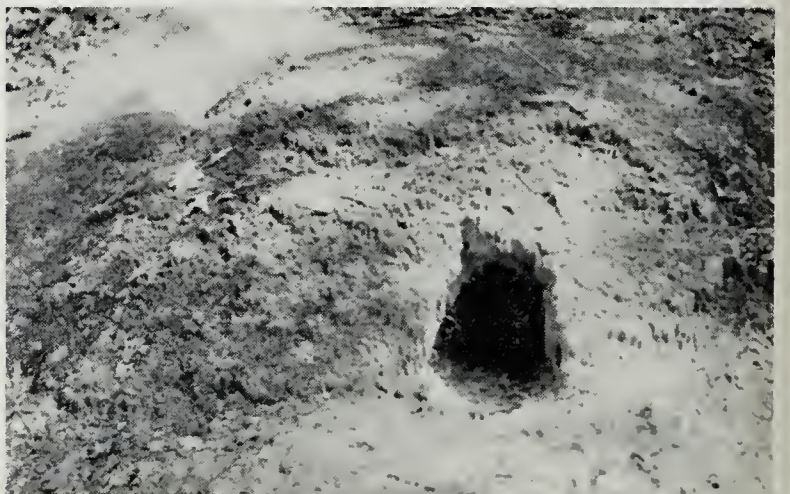
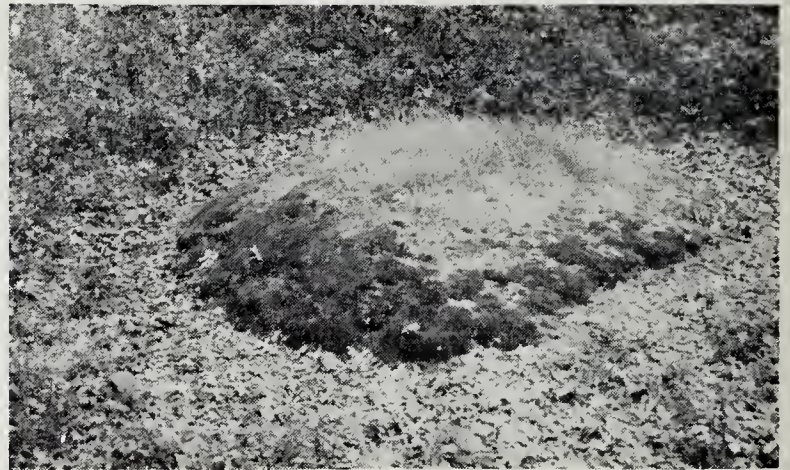
The literature indicates that some myrmecologists believe that the spread of the mossy cover eventually forces the abandonment of the mound. However, it may be that the growth of the moss possibly follows, rather than precedes, the decreasing activity of the ants. It is known that the ants keep the immediate area of the mound more or less clear of vegetation. It may be assumed that they would clear away the mosses also. Without question, there is an inverse relationship between moss cover and ant activity.

Figure 1, (Top). — Large mound with partial cover of moss and grass. Ant activity is confined to the grassy area.

Figure 2, (Second from top). — Active mound with partial cover of moss at right.

Figure 3, (Next to bottom). — Shrubs closing over abandoned mound.

Figure 4, (Bottom). — Abandoned mound with fox burrow.



Some mounds are fully active, that is, they show a band of openings in use completely around the base. In some instances, their tops have scattered grass cover. This probably is not permanent cover and occurs only with chance distribution of seeds. Older mounds, with reduced population, frequently show activity near or on the top rather than around the base.

The mounds consist of soil particles and pebbles raised from below the surface as galleries are extended, mixed with pieces of chaff. Occasionally extraneous material such as charcoal, is mixed with the material of the mound surface. The charcoal is probably from fires of many years ago.

The largest active mound is nine feet in diameter and 18 inches high. Most of the mounds do not achieve these dimensions. An average diameter would be four to five feet and average height about ten inches.

One abandoned mound, 7.5 feet in diameter, was partially explored underground by digging a trench through one side. Soil was removed to a depth of 2.5 feet which marked the lowest level of abandoned galleries below ground surface, and at this depth water began to collect in the trench. Soil color indicated an admixture of topsoil and subsoil through a vertical extension of 1.6 feet, one foot above the ground surface and six-tenths foot below. From this depth to the bottom, the galleries were in yellow gravel.

The horizontal activity appeared to have been confined to about the same dimensions as the mound at the surface, approximately 7.5 feet. As the depth below the surface increased, the diameter of the area of use decreased. The galleries were still in good condition and the mound may have been in partial use the previous summer.

The question of why these ants are in this apparently isolated location does not have an easy answer. Is this an island left by geological processes? There are comparable occurrences in the flora of South Jersey. Most notable is probably the existence of isolated colonies of *Rhododendron maximum* and *Ilicoides mucronata* in the swamps of branches of the Great Egg Harbor River in Camden and Gloucester Counties. These species in such an atypical location are apparent relicts of earlier climatic upheavals.

Zoologists have found similar instances of isolation in which the age of the displaced species is greater than that of the other species of the area. Is *Formica exsectoides* a surviving species of the last glacial period? This apparent island location is in the Pine Barrens near their southernmost limits. It is believed by geologists that the Beacon Hill formation, which coincides with the boundaries of the Pine Barrens, has been continuously out of water since upper Miocene times but has been partly or completely surrounded by water several times.

Was *Formica exsectoides* pushed southward by the glaciation of North Jersey and then trapped on the Pine Barrens island? If so, there may be other locations presently unknown to entomologists. If this is the only South Jersey location, *Formica exsectoides* may disappear from the area. The most readily accessible locality is zoned as prime residential ground. The other station may be saved in its natural condition by county or city purchase and designation as a natural area. However, continued growth of the forest for another fifty years will probably result in such changes that there will no longer be any place in the sun for *Formica exsectoides*.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Act of October 24, 1962 (Section 4109, Title 10, United States Code))		Publisher: File two copies of this form with your postmaster. Postmaster: Complete verification on page 2.	Form Approved, Budget Bureau No. 45-8028
1. DATE OF FILING 4 October 1968	2. TITLE OF PUBLICATION The ASB Bulletin		
3. FREQUENCY OF ISSUE Quarterly (January, April, July, and October)			
4. LOCATION OF HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103			
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) Dept. of Biology, Woman's College of Georgia, Milledgeville, Ga. 31061 (Dr. David L. Cottle)			
6. NAMES AND ADDRESSES OF PUBLISHER, EDITOR AND MANAGING EDITOR PUBLISHER (Name and address): The Association of Southeastern Biologists, Inc., Chapel Hill, N.C. EDITOR (Name and address): C. W. Hart, Jr., Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103 MANAGING EDITOR (Name and address):			
7. OWNER (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address as well as that of each individual must be given.)			
NAME Association of Southeastern Biologists, Inc.		ADDRESS Chapel Hill, N.C. (Dr. William J. Koch, Associate Professor, Dept. of Botany, Univ. of North Carolina, Agent.)	
8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If there are none, so state)			
NAME none		ADDRESS	
9. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES (Section 152.122, Postal Manual) (Check one) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes: ☒ Have not changed during preceding 12 months. ☐ Have changed during preceding 12 months. (If changed, publisher must submit explanation of change with this statement.)			
10. EXTENT AND NATURE OF CIRCULATION		AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	ACTUAL NUMBER OF COPIES OF SINGLE ISSUE PUBLISHED NEAREST TO FILING DATE
A. TOTAL NO. COPIES PRINTED (Net Press Run)		1500	1700
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES		none	none
2. MAIL SUBSCRIPTIONS		1100	1282
C. TOTAL PAID CIRCULATION		1100	1282
D. FREE DISTRIBUTION (including samples) BY MAIL, CARRIER OR OTHER MEANS		250	315
E. TOTAL DISTRIBUTION (Sum of C and D)		1350	1597
F. OFFICE USE, LEFT-OVER UNACCOUNTED, SPOILED AFTER PRINTING		150	103
G. TOTAL (Sum of B, C, D, E, and F—should equal net press run shown in A)		1500	1700
I certify that the statements made by me above are correct and complete. (Signature of editor, publisher, business manager or owner) C. W. Hart, Jr.			

(Continued from page 82)

search Committee to keep the authors of submitted papers anonymous. Criteria for the award are left to the discretion of the judges' panel, who may withhold said award if no paper is considered to have sufficient merit.

5. Papers must be submitted *in triplicate* and in their entirety not later than *February 15, 1969*, to Donald Caplenor, Box 186A, Tennessee Technological University, Cookeville, Tennessee 38501.

6. Announcement of the winner of the Research Prize will be made at the annual meeting.

7. The original copy of the prize-winning paper will be sent to the sponsor of the prize.

The rules and regulations governing the annual Association Research Prize of \$100.00, sponsored by the Carolina Biological Supply Company, Burlington, North Carolina, are as follows:

1. The Research Prize is to be awarded for an especially meritorious paper actually presented at the annual meeting.

2. Only members are eligible to submit papers in competition for the Research Prize. This applies to all names on the submitted paper.

3. Papers submitted in competition may be in press but must not have been published prior to March 1 of the year of the current competition.

4. Papers submitted in competition are judged by eminent scientists in the various fields of biology. These individuals are selected by the Research Committee and are from schools outside the Southeast. Every effort is made by the Research Committee to keep the authors of submitted papers anonymous. Criteria for the award are left to the discretion of the judges' panel, who may withhold said award if no paper is considered to have sufficient merit.

5. Papers must be submitted *in triplicate* and in their entirety not later than *February 15, 1969*, to Dr. Donald Caplenor, Box 186A, Tennessee Technological University, Cookeville, Tennessee 38501. One copy of the prize-winning paper will remain in the ASB files, but all other copies will be returned to the authors as soon as possible.

6. Announcement of the winner of the Research Prize will be made at the annual meeting.

IVEY F. LEWIS FELLOWSHIP AT MOUNTAIN LAKE BIOLOGICAL STATION

A Research Fellowship of \$150.00 for summer course study or research at Mountain Lake Biological Station of the University of Virginia has been continued through the generosity of the Phipps and Bird Company of Richmond, Virginia.

This fellowship, formerly known as the *Phipps and Bird Research Fellowship*, was re-named at the request of the Phipps and Bird Company. Any member of the Association may submit an application. The application should be accompanied by a summary of the planned work, by a list of important publications, and especially in the case of younger workers, by references and educational data. Applications should be sent to Dr. J. J. Murray, Dept. of Biology, Univ. of Virginia, Charlottesville, Virginia 22903 not later than 15 March 1969. The selection will be made by the Research and Awards Committee of the ASB in consultation with the Director of the Mountain Lake Biological Station. The announcement of the recipient will be made at the annual meeting of the ASB.

COMMITTEE

J. J. MURRAY, *ex officio*

JAMES RIOPEL, *ex officio*

THOMAS L. QUAY

ARTHUR W. JONES

DONALD CAPLENOR, *Chairman*

MERITORIOUS AWARD NOMINATIONS

As in previous years an honorarium of \$100 has been made available by the Will Corporation of Georgia, to be used as an award for the recognition of especially meritorious teaching by a member of the ASB. The regulations governing the award are as follows:

The recipient must be a member of the ASB in good standing. He should have taught biology in a southern institution for at least ten years, and must be currently teaching. He must not be a dean or have regular administrative duties beyond the department level (this particular criterion requiring interpretation in individual cases). Among evidences of his qualifications is the progress of the candidate as indicated by recognition in his own institution (important assignments and other contributions specifically related to good teaching); and the number and quality of students for whom he provided primarily the inspiration to continue in biology, especially those who later received advanced degrees.

Past recipients of the Meritorious Award for Teaching are as follows:

1952. Dr. Mary Stuart MacDougall (Agnes Scott)

1953. Dr. Orland E. White (Univ. of Virginia)

1954. Dr. Woolford B. Baker (Emory)

1955. Dr. John N. Couch (Univ. of North Carolina)

1956. Dr. Hugo L. Blomquist (Duke)

1957. Dr. Ezda Deviney (Florida State)

1958. Dr. Henry R. Totten (Univ. of North Carolina)

1959. Dr. Margaret Hess (Winthrop College)

1960. Dr. Ora C. Bradbury (Wake Forest College)

- 1961. Dr. Warren Deacon (Vanderbilt)
- 1962. Dr. Septima C. Smith (Univ. of Alabama)
- 1963. Father Patrick H. Yancey (Spring Hill College)
- 1964. Dr. Ruskin S. Freer (Lynchburg College)
- 1965. Dr. Harwell P. Sturdivant (Western Maryland College)
- 1966. Dr. Charles Ray, Jr. (Emory Univ.)
- 1967. Dr. H. J. Oosting (Duke University)
- 1968. Dr. Wade T. Batson (Univ. of South Carolina)

In these times in which so much is heard about teaching, it is particularly important that excellence in teaching should be rewarded and publicized in every way possible. Members of the ASB are urged to make nominations and send the needed supporting material to *Dr. Lewis Berner, Dept. of Biological Sciences, Flint Hall, Univ. of Florida, Gainesville, Florida 32601.*

COMMITTEE
 JACK H. FEHON
 WADE T. BATSON
 LEWIS BERNER, *Chairman*

SUGGESTED NOMINEES FOR ASB OFFICES AND EXECUTIVE COMMITTEE POSITIONS

To the members of the Nominating Committee:

I wish to suggest that you consider the following ASB members in selecting nominees for offices and executive committee positions:

PRESIDENT-ELECT

VICE-PRESIDENT

EXECUTIVE COMMITTEE MEMBERS (2 for 3-year terms)

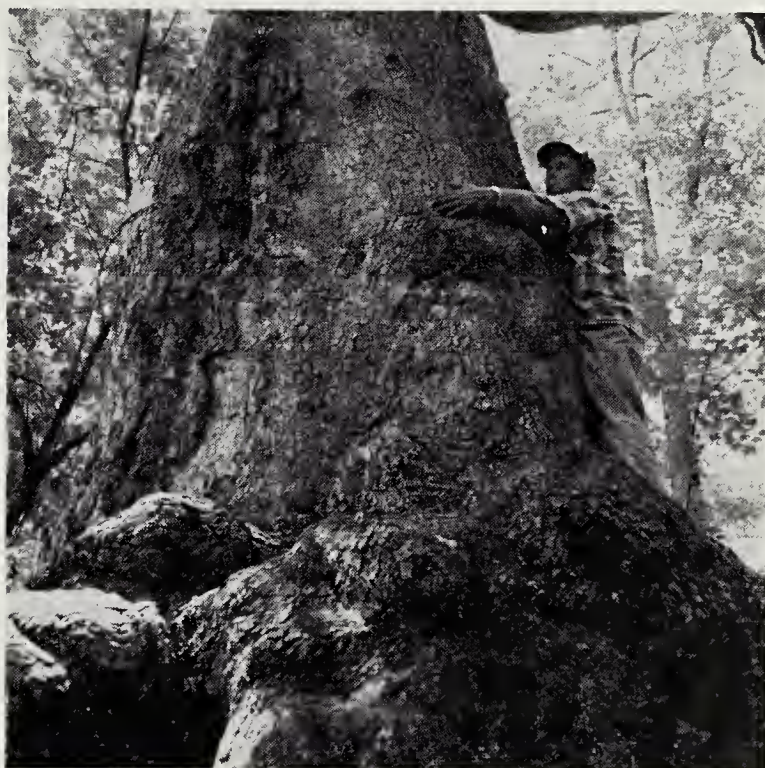
Deadline: January 1

Mail to: DR. HAROLD J. HUMM
 Marine Science Center
 Univ. of South Florida
 Bayboro Harbor
 St. Petersburg, Fla. 33701

Most of the following joined the ASB during the Athens Meeting, but their addresses were either not recorded or were recorded incorrectly. If any readers know of these missing persons, please notify Dr. Dorothy Crandall, Randolph-Macon Woman's College, Lynchburg, Virginia.

Julian Ballard
 Richard G. Clements
 Lillie Cobbs
 J. Conry
 T. D. Diamond
 Bebe Dorris
 Harold L. Eck, Jr.
 Dana Griffin

Timothy M. Gwynette
 George Hadden
 Gay Jividen
 Clifford Johnson
 B. J. Kelly, Jr.
 Philip A. LaHaye
 David E. Lesley
 Chet Michalski
 F. Montaldi
 Judy T. Morgan
 Charles H. Owens
 Theodore J. Passon, Jr.
 Robert Pope
 Ida Y. Williams
 Byron H. Wise



West Virginia's best known oak tree, the third largest chinquapin (yellow) oak in the world and the largest in the state, is alive in West Virginia University's Arboretum and as healthy as can be expected for a 400-year-old tree. Its survival was inadvertently threatened last year by construction plans which inspired protests from throughout the state. When the architect's plans were revealed, WVU had them revised to spare the tree, which is about 80 feet high and 16 feet, five inches in circumference. Its top is missing, the main trunk is hollow and a scar from being struck by lightning runs down one side. But the chinquapin oak is still growing, according to Warren G. Tennant, grounds keeper at the Arboretum in Morgantown, who is standing beside the famous tree.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — Position Vacant
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Louisiana — Harry J. Bennett, Louisiana State University
Mississippi — Joseph Fitzpatrick, Mississippi State University

North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggins, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College

West Virginia — Earl L. Core, West Virginia University

Joseph F. Fitzpatrick, Jr. — Editor
Dept. of Zoology
Mississippi State Univ.
State College, Mississippi 39762

About People

Udo Horst Ehling left the Mammalian Genetics Group, Biology Division, Oak Ridge National Laboratories (ORNL), Tennessee, to accept a position as Head of the Department of Genetics, Radiation Research Association, Munich, Germany.

Hans G. Gasson, who has been associated with the Nucleic Acid Chemistry Group, ORNL, as a Max Kade Foundation Postdoctoral Fellow, left the Biology Division to become associated with the Max-Planck Institut in Göttingen, Germany.

D. C. Vann of the Radiation Immunology Group, ORNL, left the Biology Division to accept a position in the Department of Experimental Pathology, Scripps Clinic and Research Foundation, La Jolla, California.

Chester B. Hager, associated with the Biochemical Regulation Group, ORNL, left the Biology Division to accept a position with Miles Laboratories, Elkhart, Indiana.

Vernon K. Jenkins, formerly with the Pathology and Physiology Section, ORNL, has accepted a postdoctoral fellowship in the Experimental Biology Department, Baylor University School of Medicine, Houston, Texas.

Beryl J. Ortwerth of the Enzymology Group, ORNL, has accepted a position with the Department of Surgery, University of Missouri Medical Center, Columbia.

E. H. Y. Chu, Biology Division, ORNL, spent much of the summer in China and Japan. Dr. Chu participated in the Summer Science Seminar, Academia Sinica, Chinese National Research Council, Taipei, Taiwan, China; he then presented papers at the International Congress of Genetics in Tokyo.

J. W. Angelovic, USDI, BCF, Radiobiological Laboratory, Beaufort, North Carolina, was elected president of the Atlantic Estuarine Research Society.

C. David Jennings has joined the staff of the USDI, BCF Radiobiological Laboratory, Beaufort, North Carolina. Dr. Jennings is an oceanographer.

E. F. Oakberg, J. R. Reel, W. D. Wicks, and J. L. Wittliff, Biology Division, ORNL, attended the International Congress of Oceanography in Mexico City.

W. E. Cohn, Biology Division, ORNL, attended meetings of the Combined Commission on Biochemical Nomenclature of the International Union of Pure and Applied Chemistry, and the International Union of Biochemistry in Bellagio, Italy.

Dale Howard Arner has been named Professor and Head of a newly-formed Department of Wildlife Management at Mississippi State University. Dr. Arner was formerly Associate Professor of Zoology at the institution.

Earl R. Rich, Associate Professor of Zoology, University of Miami, Coral Gables, Florida, has been named Associate Dean for academic programs, plans and developments in the College of Arts and Sciences.

Three new Assistant Professors have been appointed to the staff of the Department of Biology, University of Miami, Coral Gables, Florida: Ronald H. Hofstetter, Ph.D., University of Minnesota, ecology; Howard G. Gratzner, USPHS postdoctoral research fellow at California Institute of Technology, biochemical genetics; and Barbara N. Burkett, postdoctoral research scientist, Case Western Reserve University, insect physiology.

William S. Bradshaw has joined the staff of the Biochemistry of Cell Differentiation Group, ORNL. He was appointed an AEC Postdoctoral Fellow following receipt of his Ph.D. from the University of Illinois, Urbana in June, 1968.

The following members of the Biology Division, ORNL, attended the XII International Congress of Genetics, Tokyo, Japan: M. A. Bender, E. H. Y. Chu,

H. V. Malling, F. J. de Jerres, B. B. Webber, R. F. Kimball, and R. C. von Borstel.

Susumu Takeda, for the past year an Eleanor Roosevelt International Cancer Fellow of the American Cancer Society with the Biophysics and Human Cytogenetics Group, ORNL, has returned to his position as Head of the Department of Pathology, Mie Prefectural University, School of Medicine, Tsu-shi, Mie-ken, Japan.

Bonnie J. Roger, who received the Ph.D. degree in Plant Physiology from the University of Maryland, College Park, has joined the staff of the Microbial Photosynthesis Group, ORNL.

James A. Stewart, Postdoctoral Fellow, Biochemistry of Cell Differentiation Group, ORNL, became Assistant Professor of Biochemistry, University of New Hampshire in September.

David S. McDevitt, Postdoctoral Investigator, Cell Growth and Differentiation Group, ORNL, has accepted a position with the Department of Animal Biology, School of Veterinary Medicine, University of Pennsylvania.

Mahlon G. Kelly of Massachusetts Institute of Technology, has been appointed a NASA Visiting Professor of Biology at the University of Miami, Coral Gables, Florida. Dr. Kelly, while at Miami, will take part in the marine aspects of the Environmental Biology Program and will do research with aerial photographic techniques as applied to marine studies.

The News Editor regrets to report the recent deaths of two well-known southeastern herpetologists. **Doris M. Cochran**, deceased 20 May 1968, had retired as Curator of Reptiles and Amphibians, Smithsonian Institution, Washington, D. C. At the time of his death on 8 August 1968, **Fred Ray Cagle** was Vice-President in charge of development of Tulane University of Louisiana, New Orleans.

Ronald R. Cowden, formerly of the Louisiana State Univ. Medical Center, New Orleans, has become chairman of the Dept. of Biological Sciences, Univ. of Denver. He has been joined by the following: **Dr. John I. Payne**, Professor (formerly Associate Professor of Biology at Georgia State College in Atlanta), **Dr. William Brandon**, Associate Professor (formerly research scientist at the Delta Regional Primate Laboratory of Tulane University at Covington, Louisiana), **Dr. George B. David**, Professor (visiting Associate Professor, State University of New York at Albany) and **Dr. Sherill Curtis**, Research Associate (who received her Ph.D. in 1968, from Tulane University).

John A. Fincher, for twenty-two years a member of the faculty and administration at Samford University serving as former Head of the Department of Biology and for the past ten years as Academic Dean, resigned to accept the position of President of Carson Newman College, Jefferson City, Tennessee.

The Society of the Sigma Xi announced today through the chairman of its Grants-In-Aid of Research Committee, Dr. Harlow Shapley, an award to **Gwynn W. Ramsey** of Lynchburg College, Lynchburg, Virginia. This award has been made to Dr. Ramsey to assist him in his study of "An Ecological-Floristic Survey of Twelve Southern Virginia Piedmont Counties."

Eugene P. Odum, Alumni Foundation Distinguished Professor of Zoology at the University of Georgia and Georgia Scientist of the Year for 1967, has been named a Congressional Advisor.

Dr. Odum, who is also director of the University's Institute of Ecology, has accepted an invitation from Representative Richard L. Ottinger, D., N.Y., to advise a recently formed Ad Hoc Committee on Environmental Quality.

Representative Ottinger said the committee, made up of about 50 members of Congress both from the House and the Senate, will "be non-partisan and loosely structured in order to advance its real purpose: self education."

Dr. Odum, who has served as a United States delegate to numerous international scientific groups, was cited for his research by the State Science and Technology Commission when he was named Georgia Scientist of the Year last March. He is an internationally known expert in ecology and has headed the Institute of Ecology here since it was founded. He was also instrumental in the founding of the Savannah River Ecology Laboratory of the Atomic Energy Commission and in the formation of the University's Marine Institute at Sapelo Island.

L. H. Foster, president of Tuskegee Institute, recently appointed **James H. M. Henderson** director of the Carver Research Foundation. He succeeds the late Dr. Clarence T. Mason.

Dr. Henderson earned his Bachelor of Science degree at Howard University in 1939; M.Ph., University of Wisconsin in 1940; Ph.D., University of Wisconsin in 1943.

J. Richard Thomson is now Professional Associate, Advisory Center on Toxicology, National Research Council, National Academy of Sciences, Washington, D.C.

About Institutions

An Advanced Seminar in Tropical Botany was held at the University of Miami, Coral Gables, Florida, June 17 - July 26. Seminar coordinator was **Taylor Alexander**, Professor of Botany, University of Miami. Other faculty were **Richard A. Howard**, Arnold Professor of Botany and Director of the Arnold Arboretum, Harvard University; **Howard J. Teas**, Professor of Biology, University of Miami; and **P. B. Tomlinson**, Research Scientist, Fairchild Tropical Garden and Adjunct Assistant Professor of Botany, University of Miami. Twelve persons, ranging from college faculty to undergraduate student, were selected to participate.

The University of Miami, Coral Gables, Florida has inaugurated this September an intensive graduate level program in human-environmental biology in peninsular Florida. A full-year interdisciplinary course will involve a two-semester Advanced Ecology sequence at the doctoral level, and study areas in civil engineering, toxicology, pesticide biology, marine science, urban studies and radiation health. Subsequent years will provide for added experience in extant programs at the University and the Organization for Tropical Studies in Costa Rica. An initial-year award from the U. S. Public Health Service of \$35,716 enabling establishment of the program will grow to total \$250,000 in five years. Three current traineeships will be increased to five in 1969-70 and seven in 1970-71.

The Biology Department of The Catholic University has established an Electron Microscopy Laboratory, headed by **Dr. James A. McAlear** who was formerly with the University of California at Berkeley.

The **Federal Water Pollution Control Administration** is sponsoring a training program in the identification of pollution important organisms to be held at Georgia State College, Atlanta, Georgia, December 4th through the 21st 1968. Biologists, particularly those in the southeast, are invited to attend. Stipends are available to help defray expenses; there will be no charge for the course. The taxons to be covered include the algae, fungi, crustacea, mayflies, stoneflies, caddisflies, oligochaetes, fish, chironomids, and molluscs. Widely recognized authorities have agreed to teach each group. For applications or further information write: **Dr. Fred K. Parrish**, Program Director, Department of Biology, Georgia State College, 33 Gilmer Street, S.E., Atlanta, Georgia 30303.

Twenty-five systematic botanists from around the country were participants in the **Summer Institute in Systematics**, held at the Museum of Natural History, Smithsonian Institution, and jointly sponsored by the Smithsonian and the American Society of Plant Taxonomists, with support from NSF and the Air Force Office of Scientific Research. The southeastern U. S. was well represented: **W. C. Dickison**, Dept. of Biol., V. P. I.; **W. L. Ellison**, Erskine College; **J. W. Hardin**, Dept. of Botany, N. C. State Univ.; **E. L. Lipps**, Shorter College; **G. W. Ramsey**, Biology Dept., Lynchburg College; **J. L. Thomas**, Dept. of Biology, Univ. of Alabama; and **J. R. Watson, Jr.**, Dept. of Botany, Mississippi State University. The participants met for discussions and talks on problems dealing with systematic botany, and carried on their own research in the Herbarium during the 3-week Institute from June 23 to July 12.

The Rockefeller Foundation has recently allocated \$165,000 for a three-year extension of a cooperative educational program in the medical sciences between several US medical schools, including the University of Tennessee, and the Universidad del Valle in Cali, Colombia. **Dr. Richard R. Overman**, Associate Dean of

Medicine, serves as administrator of the University of Tennessee Medical Units' participation in the plan. The program has consisted of faculty members taking time out from duties in the US to spend time at Cali to assist Colombian educators in bringing more modern methods to the teaching of medical students. Present plans call for the establishment of the first true graduate school of medical sciences in South America.

The USPHS recently awarded a grant of \$64,556 to the University of Tennessee medical units for the third and final year of a study aimed at more effective discovery and control of uterine cancer. The experiment is under the direction of **Dr. Cyrus C. Erickson**, Professor of Pathology, with **Dr. Sidney Coleman** and **Mrs. Irma Rube** of the Department of Pathology as co-investigators. The survey is being conducted in cooperation with City of Memphis Hospitals, The Shelby County Health Department, and the UT medical units' Obstetrics-Gynecology. Under the mass-testing program initiated in 1952, the frequency of uterine cancer in Memphis has been reduced by 50 percent.

Chancellor Alexander Heard of Vanderbilt University has announced the construction of eight new buildings or additions in the areas of science and medicine. The construction of these facilities costing in excess of \$10 million will be financed through a NSF 'Center of Excellence' grant, the Health Sciences Advancement Award to Vanderbilt in 1967, loans, gifts from alumni, campaign funds, and other monies including the Ford Foundation grant. Included in the construction plans are a new Science Library, buildings for Molecular Biology and Mathematics, five new floors for the Physics Building, completion of three shell floors in the Chemistry Building, and expansion of the off-campus Dyer Observatory. The buildings will feature flexible laboratory facilities, classrooms and faculty offices, a teaching observatory, and a greenhouse.

The Department of Biology has recently moved into a new building at Tennessee Technological University. The new building is completely air-conditioned and has some 60,000 square feet of laboratory, office, and classroom space. It houses programs in biology, agriculture, and fish and game management.

One of the largest private foundation grants in University of South Carolina history was recently announced as a vital step in establishing USC as a major center for coastal and oceanographic studies.

Announcement of a \$131,450 award from the Belle W. Baruch Foundation was made by University of South Carolina President **Thomas F. Jones** and the Foundation's trustees.

The four-year grant will help "get the university into the ocean science business across the board" by establishing a new University of South Carolina Institute of Estuarine and Littoral Science, according to **Dr. James A. Morris**. He is vice president for advanced

studies and research and dean of the University of South Carolina graduate school.

The institute will spearhead research, sponsor high level seminars and colloquia, and encourage graduate instruction in coastal waterway and marine life studies.

Dr. Morris said a "scientist of unquestionable national renown" will be appointed to head the institute, which will focus on and expand the multiple marine studies already underway at the university.

The appointee will be officially designated as the Belle W. Baruch Distinguished Professor of Marine Ecology and will hold a faculty appointment in biology. He will be assisted by outstanding graduate students known as Belle W. Baruch Fellows. In addition, the institute will attract University of South Carolina faculty associates with special talents in related fields.

In this respect, its scope will be broad enough to include chemical engineers studying water conservation and pollution; geologists interested in mineral deposits, beach erosion and river sedimentation; biologists researching coastal plant and animal life; and law professors making headway in defining legal ownership and use of land off South Carolina's shoreline.

The institute will also encompass research into such areas of vital economic importance as sea farming and oyster and crab production, according to Dr. B. Theodore Cole, head of the biology department.

Estuaries, or inlets, and the littoral zone (from the high tide mark to a water depth at which light ceases) of South Carolina will be the primary research targets of the new USC Institute of Estuarine and Littoral Science.

The Belle W. Baruch Foundation plantation near Georgetown, S.C., which offers 17,000 acres of unspoiled forest land, ocean front, marshes, and other wild life preserves, is expected to be a center for much of the USC research.

Hobcaw House, the late Bernard M. Baruch's massive English manor where Winston Churchill, Franklin D. Roosevelt, and other international figures visited frequently, will be used as headquarters for colloquia and institutes. Adjacent laboratory facilities may also be developed there at the Foundation Research and Education Center.

Funding for the institute in marine studies brings the Belle W. Baruch Foundation's grants to the University of South Carolina to more than \$300,000.00. The foundation was established in 1964 by the late Miss Baruch, daughter of Bernard M. Baruch, to promote "teaching and/or research in forestry, marine biology, and the care and propagation of wildlife and flora and fauna in South Carolina in connection with colleges and/or universities in the state of South Carolina."

To this end, the foundation earlier awarded a University of South Carolina research associate, Dr. George P. Spinner, a \$100,000 grant to evaluate estuarine areas of the entire Atlantic coastline from Maine to Florida. The three-year project will determine what can be done to preserve these areas and increase their productivity.

Dr. Wade T. Batson of the University of South Carolina biology department is director of a \$71,623 Baruch grant to develop a botanical inventory of the foundation's immense low-country plantation. The University of South Carolina is also cooperating with Albert H. H. Dorsey on a Belle W. Baruch Foundation grant to the S.C. State Department of Education. This grant, in the amount of \$172,540 is for the development of a series of teachers' guides for the teaching of conservation in grades 1-12.

The latest Baruch Foundation grant and the new Institute of Estuarine and Littoral Science will also focus on the already strong marine orientation of the Department of Geology.

Dr. Donald J. Colquhoun is one of the leading authorities on the geology of the South Atlantic coastal plains and Dr. John R. Conolly has done major research into the marine geology of continental shelves, slopes, and abyssal plains. Dr. Conolly will join the University of South Carolina this fall. Dr. Bruce Nelson, former head of the department and now dean of the College of Arts and Science, is a specialist in estuarine sedimentation, clay mineralogy and geochemistry.

Two members of the University of South Carolina law school faculty, William A. Clineburg and John E. Krahmer, are studying the legal bases for ownership of tidal and submerged lands under the earlier foundation grant to Dr. Spinner.

Another law professor, C. H. Randall, is conducting an overall study of water laws in South Carolina for the State Water Resources Commission. Waters adjacent to the Belle W. Baruch Foundation plantation are also involved in a separate study of marine botany by Prof. William H. Queen of the biology department.

Practically the entire Department of Chemical Engineering is engaged in research on either water pollution or chemical properties of water. These include studies by department head B. L. Baker into removal of synthetic detergents from water and a study of purification of industrial waste by Dr. Milton W. Davis. Dr. J. H. Gibbons and Dr. F. Phillips Pike are directors of a research project on mixing of stratified layers as related to physical oceanography.

It is expected that the wide inter-disciplinary character of the Institute of Estuarine and Littoral Science will encompass all of these now separate projects.



Books and Periodicals

Your editors have considered the service which could be rendered by having a Book Review Section as a regular feature of the Bulletin. They cannot, however, perform such a service unaided. Persons who could provide prompt, succinct and critical reviews of new books in the biological sciences are invited to submit their names and areas of competence to the News Editor. Such response will be the basis of a final decision on a Book Review Section.

New Botanical Publication

Botanical research articles of unusual length (50-150 ms. pages) will be considered for publication in *Tulane Studies in Zoology and Botany* (formerly *Tulane Studies in Zoology*). Shorter papers will also be considered. This journal is published by the Graduate School and has an average circulation of 1000 copies. It is sent in exchange to university libraries and research centers throughout the world. Articles which are submitted will be promptly reviewed and edited. For further information write: Prof. G. E. Gunning (Editor) or Prof. A. L. Welden (Assoc. Editor), Dept. Biology, Tulane Univ., New Orleans, La., 70118.

THE MANUAL OF THE FLORA OF THE CAROLINAS. Albert E. Radford, Harry E. Ahles, and C. Ritchie Bell. The University of North Carolina Press, Chapel Hill, N.C. 27514. \$15.95.

This is the first illustrated manual to cover the rich and varied flora of the Carolinas. Based on the recent collection of nearly 200,000 specimens, the book has been twelve years in the making and is expected to be a landmark in botanical publishing. It will be useful in each of the southeastern states, and was designed for botanists, students and teachers, foresters, wildlife and conservation researchers, county agents, libraries, and all those interested in the native and naturalized plants covered.

INSECTS AND PHYSIOLOGY. Edited by J. W. L. Beament and J. E. Treherne. American Elsevier Publishing Company. 378 pp. 1968. \$25.00

This volume was prepared as a tribute to Sir Vincent Wigglesworth on his retirement from the Quick Chair of Biology and the Directorship of the Unit of Insect Physiology in the University of Cambridge.

The book consists of twenty-three chapters each by a different author and is divided into ten sections. The arrangement of subject matter is, generally speaking, the same as that used by Wigglesworth in his "Principles of Insect Physiology." The sections are: the integument; morphogenesis; neurosecretion; flight; the central nervous system; pharmacology; sensory physiology; behaviour; permeability; reproduction. These sections contain from five (morphogenesis) to one (flight, pharmacology and reproduction) chapters.

If the book were to be considered only as a tribute to VBW, there would be little more to be said. He is one of the most important biologists of this century and it is fitting and proper that he be honored. That twenty-three of his present and former associates were motivated to put this book together speaks eloquently of the regard in which they hold him. However, the reviewer must examine the work as a contribution to the literature of biology and in this regard, one can only conclude that, as with many compilations by different authors, it is a mixed blessing.

The publisher is to be commended on the high-quality printing and reproduction evident throughout. It is well printed and singularly free from minor errors. The quality of reproduction shows up particularly in the electron micrographs. In the articles by Smith and Slifer the elegant electron microscopy for which they are noted is well brought out in the plates.

Many of the articles are likewise excellent. It is, perhaps, unfair to mention some of these in preference to others but one cannot pass by without noting that the style, which has become characteristic of Carroll M. Williams, adds much to the already interesting subject matter of his article on the brain hormone. Lawrence's discussion of the epidermal cell as "a model of the embryo" is intriguing while Locke's article adds even more fuel for thought on these cells. Weis-Fogh gives a very succinct summary of the metabolic events occurring during flight. Various aspects of nervous and sensory physiology are treated well by Edwards, Treherne, Burt and Miller.

The self-imposed restriction of having only insect physiologists associated with VBW write chapters, while entirely understandable, is probably the cause of the book's major faults. Many of the more biochemically oriented aspects of insect physiology which have been so fruitful in recent years are not included while in a number of cases the author for a particular topic is not the best available. In addition, the choice of subject by several of the authors who were selected appears unfortunate. This is particularly true in the case of "The physiology of the insect integument in the relation to the invasion of pathogens" by W. A. L. David and "Evolutionary aspects of metamorphosis" by A. N. Clements. Neither of these authors could contribute a single reference from his own work to the bibliography of his contribution.

When the high price of this book is considered along with some of its faults, this reviewer is almost forced to the conclusion that private tributes should be privately circulated. In spite of this, the book does contain much of value and anyone with a serious interest in the physiology of the insecta should at least delve into it.—Ernest Hodgson, North Carolina State University

The ASB

BULLETIN

PLEASE PRINT NAME LEGIBLY
AND MARK * IF URGENTLY

Volume 16, Number 1

January, 1969



Killdeer, *Charadrius vociferus*

Fred G. Taylor, Jr.

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

ASB BULLETIN

Volume 16, Number 1 - January, 1969

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy L. Crandall, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Georgia College, Milledgeville, Georgia 31061. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Robert B. Short, Florida State University

Retiring President — Harold J. Humm, University of South Florida

President Elect — John M. Carpenter, University of Kentucky

Vice-President — James W. Hardin, North Carolina State University

Secretary — Dorothy L. Crandall, Randolph Macon Woman's College

Treasurer — David J. Cotter, Georgia College

Executive Committee — Albert E. Radford, University of North Carolina; John D. McCrone, University of Florida; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman

CONTENTS

About the Memphis Meeting	3
Books and Periodicals	6
News of Biology in the Southeast	7
Directory of ASB Members	9



About the Memphis Meeting

The Association of Southeastern Biologists will hold its 30th annual meeting April 17-19, 1969, at Memphis State University, Memphis, Tennessee. Registration and most of the other activities will be in the University Center. The program Thursday evening will begin at 7:30 in the Ballroom of the University Center. The General Session will be followed by a smoker in the main lounge and adjacent lounges in the Center. Exhibits will be on display on the 3rd floor lounge. Paper sessions and the annual business meeting will be held Friday. The Friday evening banquet and presentation of awards will be held in the Ballroom of the University Center. The retiring President's address will follow the banquet.

Registration

University Center, 3rd Floor

4:00 P.M. to 7:15 P.M., Thursday

8:00 A.M. to 11:00 P.M., Friday

Fee — \$2.00

Exhibits

University Center, 3rd Floor Lounge

2:00 P.M. to 11:00 P.M., Thursday

8:00 A.M. to 5:00 P.M., Friday

8:00 A.M. to 11:00 A.M., Saturday

Paper Sessions

University Center, Ballroom and meeting rooms, Friday.

Other scheduled events

7:00 A.M. (Friday) Breakfast and Business Meetings: Southern Appalachian Botanical Club and Southeastern Section Botanical Society of America: Highland Towers.

GENERAL INFORMATION

Few cities are so advantageously located as Memphis. Beyond that, Memphis counts all four modes of transportation—river, rail, motor and air. These are the lifelines that link Memphis with big and growing markets throughout the Southeast and Southwest, and the Midwest. Memphis, the largest city in Tennessee, is located on the edge of the Mississippi River. Spring and fall are the most beautiful seasons, with mild weather and a great display of floral colors. Along with industry, education is called the biggest "business" in Memphis and Shelby County. Memphis State University is the second largest state university with an enrollment excess of 16,500. The university has over 40 buildings on its main 125-acre campus in residential East Memphis. Another 146-acres are being developed close to the main campus along with 623-acres which will serve as a conference center and a biological field station. Other educational and research facilities located in Memphis include Southwestern; Christian Brothers College; University of Tennessee Medical Units; St. Jude Research Hospital and many other commercial research laboratories. Memphis is the leading cultural center of a seven state Mid-South area. Points of interest are the Brooks Memorial Art Gallery, Memphis Museum, Front Street Theater, Memphis Opera Theater, Memphis Symphony Orchestra, Arts Center Inc., Memphis Art Academy and many others. Information concerning these and other attractions may be obtained at the Registration Desk.

Travel to Memphis

Suggested automobile routes to Memphis are as follows:

From the Northeast Interstate 40

From the Southeast Highway US 72 or US 78

From the South Interstate 55

Greyhound and Continental Trailways Bus lines serve Memphis. All the major airlines such as American, Delta, Allegheny, Braniff, Eastern, Piedmont, Southern, and others serve Memphis. The air terminal is within a few minutes drive of the campus. Limousine service is available to downtown Memphis only.

Parking

Parking facilities are available in the parking lot adjacent to the Highland Towers. This facility is two blocks from the main campus. Parking on the campus will be difficult if not impossible.

Dining Facilities

Breakfast and Lunch will be served in the Highland Towers. Members of the association and their guests will find it convenient to use the main cafeteria in the University Center. This facility, however, is usually crowded between 11:30 and 12:30. Several fine restaurants are located within 1½ miles of the campus. They are as follows:

Embers	Roaring Seventies
Villa	Knickerbocker
Pete and Sam's	Britling's Cafeteria
Lua	Morrison's Cafeteria

Field Trips

At the present, pending expression of interest, the following field trips are planned:

1. A Saturday morning field trip is being planned in Ornithology by Robert W. McGowan, Biology Department. This group will visit the Chickasaw Bluff areas and the alluvium of the Mississippi River, both areas in the Meeman-Shelby Forest State Park, located about 25 miles north of Memphis. Also, time permitting, the group may visit the Memphis State University Meeman Biological Field Station, which is being developed in an area adjacent to the state park.

Participants should indicate their interest in this field trip at the time of registration. Additional information will be made available during the meeting. If interested, bring binoculars and field clothes.

2. A botanical field trip is being planned to the Chickasaw Bluffs along the Mississippi River northwest of Memphis. This will include a short tour of the facilities and adjacent grounds of the recently-established Meeman Biological Field Station. Inasmuch as this 623-acre tract is a nature preserve, botanical collecting will not be permitted, but following the tour of the Field Station, participants will be taken to the nearby 12,000-acre Meeman-Shelby Forest State Park, where by arrangement with the management, collecting may be done. A very rich vascular flora is to be found on the Chickasaw Bluffs including *Cladrastis lutea*, yellowwood, *Gymnocladus dioica*, Kentucky coffee-tree and *Magnolia acuminata*, cucumber magnolia, all quite restricted in range in west Tennessee. Participants should indicate their interest in this field trip at the time of registration.

It is anticipated that this trip will begin at 8 a.m., Saturday, April 19 at Memphis State University. Return will be not later than 4 p.m. Eating facilities are available for lunch in the state park.

3. Plans are being made for a Saturday morning field trip to Chucalissa Indian Village. This archaeological research and training site is operated by Memphis State University. Adjoining land is used as a biological field station. Exhibits at the Chucalissa Museum are open to the public. This prehistoric village is located in Southwest Shelby County about 13 miles from the main campus. Participants should indicate their interest at the Registration Desk.

Placement Service

A registry of employers and potential employees will be available. For those who wish, interview schedules will be arranged. The employment opportunity bulletin board service will also be established.

Accommodations

University Accommodations — Highland Towers, a modern, air-conditioned facility located two blocks from the main campus and minutes from fine shopping areas in Memphis. Brochures containing information on these accommodations were sent out in December. There are ample parking spaces adjacent to the Towers. Public ac-

commodations — Listed below are motels and hotels which are available and may be located on the cover map of the ASB Bulletin. (*) are motels which are only a few minutes drive from the campus.

1. Admiral Benbow Inn, Airport
2201 Winchester Rd.
2. Admiral Benbow Inn, East *
4720 Summer Ave.
3. Admiral Benbow Inn, Midtown
1220 Union Ave.
4. Albert Pick Motor Inn
300 North Second St.
5. Chisca Plaza Motor Hotel
272 S. Main St.
6. Claridge Hotel
109 N. Main St.
7. Downtowner Motor Inn
160 Union Ave.
8. Holiday Inn, Brooks Rd.
1441 E. Brooks Rd.
9. Holiday Inn, Central *
1837 Union Ave.
10. Holiday Inn, Downtown
22 N. Third St.
11. Holiday Inn, East *
4941 Summer Ave.
12. Holiday Inn, Jr. *
3020 Lamar Ave.
13. Holiday Inn, Medical Center
969 Madison Ave.
14. Holiday Inn, Midtown
1262 Union Ave.
15. Holiday Inn, North
4022 Thomas St.
16. Holiday Inn, Poplar-East *
5679 Poplar Ave.
17. Holiday Inn, Rivermont
200 W. Georgia
18. Holiday Inn, Riverbluff
340 W. Illinois Ave.
19. Holiday Inn, South
2300 S. Bellevue Blvd.
20. Holiday Inn, Southeast *
3728 Lamar Ave.
21. Holiday Inn, Southwest
980 So. Third St.
22. Holiday Inn, West Memphis
Interstate 210 Hwy. 40
23. Holiday Towers
383 Madison Avenue
24. Howard Johnson's, Midtown *
1318 Lamar Ave.
25. Howard Johnson's, South
3280 Highway 51 S.
26. King Cotton Hotel
69 Jefferson Ave.

27. Linden Lodge Motel
176 Linden Ave.
28. Quality Courts Motel
271 W. Alston
29. Ramada Inn, East *
5225 Summer Ave.
30. Ramade Inn, South
3265 Highway 51 S.
31. Ramada Inn, West Memphis
1100 N. Ingram Blvd.
32. Sheraton Motor Inn
889 Union Ave.
33. Sheraton-Peabody Hotel
149 Union Ave.
34. Travelodge, Crump Blvd.
180 E. H. Crump Blvd.
35. Travelodge, Downtown
265 Union Ave.
36. William Len Hotel
110 Monroe Ave.

To accommodate as many people as possible, private rooms and private baths are not available in Highland Towers. Inquiries should be made to: Central Towers — Highland Towers, 3599 Central Ave., Memphis, Tennessee 38111.

Local Arrangements Committee

Co-Chairmen	C. D. Brown V. E. Feisal
Housing and Family Activity	G. W. Tate, Jr.
Banquet, Food Service	G. W. Tate, Jr.
Smoker, Exhibits	P. R. Simonton H. R. Bancroft D. B. Folden
Field Trips	R. W. McGowan E. T. Browne B. A. Simco
Meeting Rooms, Audio-Visual	O. E. Smith
Finance	A. E. Perry
Registration	Priscilla S. Rushton Martha A. Powell Diane O. Fleming
Placement Program	M. H. Harvey J. T. Darlington E. T. Browne C. O. Warren
Transportation	A. E. Perry

Books and Periodicals

PROTIDES OF THE BIOLOGICAL FLUIDS — PROCEEDINGS OF THE FIFTEENTH COLLOQUIUM, BRUGES, 1967. Edited by H. Peeters. Elsevier Publishing Company, Amsterdam, London, New York. 626 pp. 1968. \$34.50.

There are four major areas included of particular interest and use to the cellular biologist. The first is the *Academic Lecture*, "The Functions of Plasma Proteins" delivered by Dr. Tristram Freeman (London) in which he summarized present knowledge and postulated some interesting ideas. Some of the suggested research problems involve transferrin, haptoglobin, and fibrinogen. The proposal may have more intricacies than intended by the author in that the nature and cause of some illnesses will be understood when the function and metabolism of about two dozen plasma proteins are known.

The second part of the book concerns the cellular membranes. Most of this deals with various aspects of cytoplasmic membranes. A section on the molecular structure and function of protein in mitochondrial membranes is particularly outstanding.

The third area involves complement activity of components and inactivators. The primary contribution is the conclusion that more research is necessary before the actions of complement components involved with homograft and heterograft rejection, or membrane lesions, are understood. Much of the discussion concerns nomenclature and techniques for the separation of complement components.

The fourth area is devoted to separation methods. These methods deal with free electrophoresis, ion exchange celluloses and polyacrylamide gel electrophoresis and filtration.

This work includes discussions and papers concerning permeability, transport, membranes, and techniques associated with their study. The price may seem high until the binding, quality of the paper, and printing are examined. An appropriate adjective for this book is, *superb*. — JOHN F. DIMMICK, *Wake Forest University*.

AN ATLAS OF BIOLOGICAL ULTRASTRUCTURE. John D. Dodge. American Elsevier Publishing Co. New York. 80 pp. 1968. \$10.50.

This book is a selection of beautifully made and printed electronmicrographs. They are aimed at providing the student with a good selection of micrographs for study to supplement the few usually found in current textbooks. The text is chiefly limited to a description of the subject of each photograph.

Arrangement of the book is in four sections: 1. The Cell and Its Organelles; 2. Animal Cells and Tissues; 3. Plant Cells and Tissues; and 4. Bacteria and Viruses.

These sections are composed of 30, 63, 71 and 17 electronmicrographs, respectively. Each of the 181 photographs is excellent, clear, well-labeled, and furnished with an adequate but concise description.

A 3-page well-illustrated Appendix deals concisely but clearly with A. The Electron Microscope; B. Preparation of Material for Electron Microscopy; and C. Resolution and Magnification of the Electron Microscope. References are listed to key general works in the field, to electron microscope techniques, and to journals dealing with ultrastructure, in addition to specialized references in connection with the topics of each of the four main sections.

The work should be extremely helpful to the student, and perhaps especially the early student, of cell ultrastructure. — WALTER S. FLORY, *Wake Forest University*.

BARLEY VARIETIES — EBC. G. Aufhammer, P. Bergal, A. Hagberg, F. R. Horne and H. Van Veldhuizen. American Elsevier Publishing Co., New York. 156 pp. 1968. \$16.50.

Barley varieties are frequently interchanged between countries. This book, prepared under auspices of the European Brewery Convention (EBC), provides authoritative information useful, and needed, when varieties are exchanged. This is based on wide experimental testing, involving 15 European countries. All text, including descriptions, is given in each of three languages, English, French and German.

Opening sections deal with grain characters used in identifying varieties, and with the reaction of barley varieties to DDT. Open and closed flowering is also discussed.

A list of some 230 barley varieties, with pedigrees, is alphabetically arranged. This is followed by pedigree charts for Dutch, British and Irish, French, Scandinavian and German barley varieties, respectively.

The greater part of the book is directed to the detailed descriptions of 38 varieties in use in the international or national trade. All are spring barley varieties except the winter variety Prima. Varieties of malting barley are included in the descriptions when they have successfully completed three years in the EBC Barley Committee trials or when acreage in one or more of the member countries of the EBC has risen to 5% or more.

Each varietal description is accompanied by a full page of photographs showing the entire ear, or head, together with enlarged views of the grain from two different angles. Descriptions furnish information for each variety regarding origin, ear and grain characters, vegetative and agronomic characters, susceptibility to each of five diseases (*Erysiphe graminis*; *Puccinia glumarum*; *Puccinia hordei*; *Rhynchosporium*; and *Ustilago nuda*) and grain quality.

This book will be essential for anyone dealing with the genetics, breeding, or brewing of barley. It will be useful as a general agronomic reference book on barley, and also will find a welcome place on the reference shelf of many economic botanists. — **WALTER S. FLORY**, *Wake Forest University*.

MARINE MOLLUSK
JOURNAL REPRINTED

Volume 1 of *Johnsonia*, a monographic series on the

mollusks of the Western Atlantic, published at Harvard University from 1941-45, has been out-of-print for ten years. It is now available in a facsimile reprint for \$15.00, less than the cost for the original. The important families covered by Drs. Clench, Abbott, Turner and Bequaert include the Conidae, Muricidae, Strombidae, Littorinidae, etc. Obtainable from Dr. W. J. Clench, Museum of Comparative Zoology, Cambridge, Mass. 02138, or W. and R. McCauley, 1919 Sandy Hill Road, Apt. C-12, Norristown, Pa. 19401.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — Position Vacant
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Louisiana — Harry J. Bennett, Louisiana State University
Mississippi — Joseph Fitzpatrick, Mississippi State University

North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College

West Virginia — Earl L. Core, West Virginia University

Joseph F. Fitzpatrick, Jr. — Editor
Dept. of Zoology
Mississippi State Univ.
State College, Mississippi 39762

NOTICE — The "News Section" of the *Bulletin* is only as good as **you** make it. Forward items of interest to the News Editor, or if you are too busy, inform your Public Relations Office of this Service; they probably would be happy to send items of information.

About People

Anthony J. F. Griffiths has joined the Fungal Genetics Group, Oak Ridge National Laboratories, Oak Ridge, Tennessee, as a USPHS Postdoctoral Fellow.

Ralph A. Zingaro has joined the Enzymology Group, ORNL, as a USPHS Postdoctoral Fellow.

Daniel H. Odell, a Research Participant with the Plant Physiology and Photosynthesis Group, ORNL, has returned to his position of Professor of Biology, East Tennessee State University, Johnson City.

Richard Cowan, Director, U. S. National Museum, Washington, D. C., received the Henry Allan Gleason Award of the New York Botanical Garden at the 1968 meeting of the Botanical Society of America in recognition of his work on the genus *Swartzia*.

Charles N. Boehms, formerly Associate Professor of Biology, Austin Peay University, Clarksville, Tennessee, has been named Dean of Students at that institution.

Staff members of the Department of Biology, Austin Peay State University, Clarksville, Tennessee, currently on leave are **David Snyder** (to University of Notre Dame) and **Ben Stone** (to University of Tennessee).

John M. Boyle, a graduate of the University of Sussex, Falmer, Brighton, England, has joined the staff of the Biophysics Group, ORNL, as an SRC/NATO Postdoctoral Fellow.

Richard P. Quinn has joined the staff of the Immunology Group, ORNL, as a USPHS Postdoctoral Fellow. Dr. Quinn is a graduate of Oregon State University.

Robert M. Smillie has joined the Microbial Photosynthesis Group, ORNL, as a Consultant. Dr. Smillie received his degree from Queens University, Kingston, Canada.

Frank P. Conte, a graduate of the University of California, Berkeley, has joined the Enzymology Group, ORNL, as a USPHS Senior Postdoctoral Fellow.

Gary L. Whitson resigned from the Cytology and Genetics Group, ORNL, to accept a position with the Department of Zoology, University of Tennessee, Knoxville.

Alexander Hollaender, Biology Division, ORNL, spent two weeks in Europe in late October to attend the International Atomic Energy Agency panel meeting in Vienna, Austria, and to confer with English and French Scientists.

Gerald J. Stine, a Postdoctoral Investigator with the Microbial Genetics Group, ORNL, has accepted a position with the Department of Biology, University of Tennessee, Knoxville.

Yukinobu Nishimara, a graduate of Osaka University, Osaka, Japan, has joined the Molecular Biophysics Group, ORNL, as a Postdoctoral Fellow.

About Institutions

On December 18-20, 1968, an international conference on Physical Principles of Biological Membranes was held at the Center for Theoretical Studies of the University of Miami, Coral Gables, Florida. Among the participants were Maurice Wilkins, Nobel Laureate, London University, England; Britton Chance, University of Pennsylvania; George Eisenman, University of Chicago; Francis O. Schmitt, Massachusetts Institute of

Technology; and R. Schlögl, Max-Planck-Institute for Biophysics.

The national headquarters for the Organization for Tropical Studies has been established at the University of Miami, Coral Gables, Florida. Executive director will be Jack T. Spencer, formerly program director of the Facilities and Special Programs, Biological and Medical Sciences Division of NSF. Dr. Spencer will hold an appointment as senior research scientist at the University of Miami.

A new program of graduate training and research in ecology has recently been launched at The University of Tennessee. Titled the Graduate Program in Ecology, it is an interdisciplinary organization involving staff from six departments in two colleges of the University and from the Oak Ridge National Laboratory. This will enable students to major in ecology and earn the degrees of Master of Science and Doctor of Philosophy in this field. Persons interested should write to the Director, Graduate Program in Ecology, 501 Hesler Biology Building, University of Tennessee, Knoxville, Tennessee 37916.



Conus geographus

DIRECTORY OF ASB MEMBERS

The following directory is, to the best of our knowledge, correct as of 1 December 1968. Because some mistakes invariably find their way into listings such as this, the Editor would greatly appreciate it if members who note omissions and mistakes would call them to his attention.

A

ROLAND ABEGG, Dept. of Zool., La. Polytechnic Inst., Ruston, La. 71270
 CHARLES O. ABERNATHY, Department of Entomology, North Carolina State University, Raleigh, N. C. 27607
 CURTIS H. ADAMS, Biology Department, University of Ala. in Huntsville, P. O. Box 1247, Huntsville, Ala. 35807
 JOSEPH E. ADAMS, P. O. Box 333, Chapel Hill, N. C. 27514
 WILLIAM H. ADAMS, JR., 4004 Moss Dr., Annandale, Va. 22003
 DAVID ADCOX, 4157 Elizabeth Park, Conley, Ga. 30027
 DAVID W. ADCOX, JR., 4157 Elizabeth Park, Conley, Ga. 30027
 PETER E. ADOLEY ADDO, Bennett College, Greensboro, N. C. 27402
 HOWARD I. ADLER, Biology Division, P. O. Box Y, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
 HENRY C. ALDRICH, Department of Botany, University of Florida, Gainesville, Fla. 32601
 TAYLOR R. ALEXANDER, Department of Biology, University of Miami, Coral Gables, Fla. 33124
 JOHN V. ALIFF, Dept. of Zoology, Univ. of Kentucky, Lexington, Ky. 40506
 WENDALL E. ALLAN, Dept. of Biology, East Carolina University, Greenville, N. C. 27834
 CHARLES M. ALLEN, Box 7211, Reynolda Station, Winston-Salem, N. C. 27109
 FRANK H. ALLEN, Department of Biology, Wilmington College, Wilmington, N. C. 28401
 J. FRANCES ALLEN, 6000-42nd Ave., No. 311, Hyattsville, Md. 20781
 RALPH D. AMEN, Box 7325 Reynolda Station, Wake Forest, Winston-Salem, N. C. 27106
 C. E. ANDERSON, Department of Botany, N. C. State University, Raleigh, N. C. 27601
 LUCY G. ANDREWS, Department of Biology, Brenau College, Gainesville, Ga. 30501

TED F. ANDREWS, Director of Science, Ed. Res. Counc. of Cleveland, Rockefeller Bldg., Cleveland, Ohio 44113
 JOSEPH ANGELOVIC, Radiobiological Lab., U. S. Bur. Comm. Fisheries, Beaufort, N. C. 28516
 ROBERT J. ANTHONY, SR., 5151 Williams Drive, Jackson, Miss. 39209
 ARTHUR L. APPLGATE, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101
 JUDY ARANT, University of S. C., Dept. of Biology, Columbia, S. C. 29208
 GUSSIE ARNETT, Virus Section-Chemotherapy Div., Southern Research Institute, 2000-9th Ave., S., Birmingham, Ala. 35205
 JAMES D. ARNETT, JR., Clemson University at Sumter, Sumter, S. C. 29150
 JOHN G. ARNOLD, JR., Dept. of Medical Technology, Loyola University, New Orleans, La. 70118
 BETTY JEAN ASHBROOK, Box 67, Cullowhee, N. C. 28723
 WILLIAM CLARK ASHBY, Dept. of Botany, Southern Illinois University, Carbondale, Ill. 62901
 RALPH P. ASHWORTH, Dept. of Botany, Clemson University, Clemson, S. C. 29631
 JAMES W. ATKINSON, Dept. of Biology, Emory University, Atlanta, Ga. 30322
 JACK C. AVERY, Route 3, Box 204, Oneonta, Ala. 35121

B

JOHN A. BADEN, 613 Tennyson Avenue, Winchester, Va. 22601
 KATHLEEN W. BADENHOP, 2141 Indian Hills Drive, Route 14, Knoxville, Tenn. 37919
 DONALD W. BAILEY, 1750 Normal Drive, Bowling Green, Ky. 42101
 PAUL C. BAILEY, 1220 Greensboro Road, Birmingham, Ala. 35208
 C. L. BAKER, Southwestern College, Memphis, Tenn. 38112
 JAMES L. BAKER, P. O. Drawer LW, State College, Miss. 39762

W. WILSON BAKER, Route 1, Box 160, Tallahassee, Fla. 32301
 ROBERT E. BALDWIN, Dept. of Biology, The Citadel, Charleston, S. C. 29409
 ERNEST A. BALL, Dept. of Botany, North Carolina State College, Raleigh, N. C. 27607
 S. K. BALLAL, Tennessee Tech., Cookeville, Tenn. 38501
 BUENA S. BALLARD, P. O. Box A6, Gulf Coast Research Lab., Ocean Springs, Miss. 39564
 RONALD BAMFORD, The Graduate School, University of Maryland, College Park, Maryland 20740
 STUART S. BAMFORTH, Newcomb College of Tulane University, New Orleans, La. 70118
 GAIL S. BANGMA, Miss. State College for Women, Dept. of Biological Sci., Columbus, Miss. 39701
 JOHN P. BAPTIST, Radiobiological Laboratory, U. S. Bureau Commercial Fisheries, Beaufort, N. C. 28516
 ROGER W. BARBOUR, Dept. of Zoology, University of Kentucky, Lexington, Ky. 40506
 FRANK H. BARCLAY, 2823 W. Walnut St., Johnson City, Tenn. 37601
 ROBERT L. BARNES, 5303 Revere Road, Durham, N. C. 27707
 MARY A. BARNETT, 49 Mayson Ave., NE, Atlanta, Ga. 30317
 THOMAS C. BARR, JR., Dept. of Zoology, University of Kentucky, Lexington, Ky. 40506
 ELTON R. BARRETT, Dept. of Biology, N. E. Louisiana State College, Monroe, La. 71201
 B. A. BARRINGTON, JR., Department of Anatomy, Medical College of S. Carolina, Charleston, S. C. 29401
 JOHN M. BARRY, 425 Cedar Street, Morgantown, W. Va. 26505
 JAY BARTON, Dept. of Biology, West Virginia University, Morgantown, W. Va. 26505
 DANIEL W. BATH, JR., Box 1347, University, Miss. 38677

- WADE T. BATSON, Dept. of Biology, Univ. of South Carolina, Columbia, So. Carolina 29208
- BILLY S. BATTS, 1004-7th Avenue, Farmville, Va. 23901
- LAWRENCE S. BAUM, Department of Biology, Northeast Lo. State College, Monroe, La. 71201
- STEELE H. BAXTER, Department of Biology, Lynchburg College, Lynchburg, Va. 24504
- ERNEST O. BEAL, Dept. of Biology, Western Kentucky University, Bowling Green, Ky. 42101
- LUTHER STANFORD BEARD, Box 366, Buies Creek, N. C. 27506
- ALVIN V. BEATTY, Dept. of Biology, Box 15272, Emory University, Atlanta, Ga. 30322
- JEANNE W. BEATTY, Box 15272, Emory University, Atlanta, Ga. 30322
- EDWIN G. BECK, Department of Botany, University of Georgia, Athens, Ga. 30601
- FRED BECKERDITE, Route #4, Red Springs, N. C. 28377
- ELLINOR H. BEHRE, Black Mountain, North Carolina 28711
- JANE C. BELCHER, P. O. Box 46, Sweet Briar, Va. 24595
- C. RITCHIE BELL, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514
- GEORGE A. BELL, JR., Box 1397, Gastonia, N. C. 28052
- RONDAL E. BELL, Department of Biology, Millsaps College, Jackson, Miss. 39210
- SANDRA L. BELL, Department of Botany, University of Tennessee, Knoxville, Tenn. 37916
- VINCENT J. BELLIS, Dept. of Biology, East Carolina University, Greenville, N. C. 27834
- ARTHUR C. BENKE, Department of Zoology, University of Georgia, Athens, Ga. 30601
- CHARLOTTE D. BENNETT, Ewing Road, Box #26, Route #5, Austell, Georgia 30907
- HARRY J. BENNETT, Box 8985, Dept. of Zoology, Louisiana State University, Baton Rouge, La. 70803
- JERRY BENNETT, General Delivery, Magee, Miss. 39111
- MIRIAM FRANCES BENNETT, Dept. of Biology, Sweet Briar College, Sweet Briar, Va. 24595
- SARA N. BENNETT, Science Dept., Georgia Southern College, Statesboro, Ga. 30458
- DON GEHR BENSON, JR., Dept. of Biology, Virginia Polytechnic Institute Blacksburg, Va. 24061
- GEORGE L. BENSON, Box 1197 Southern State College, Magnolia, Ark. 71753
- EUGENE T. BERGQUIST, Georgia Southern College, Statesboro, Ga. 30458
- EDMUND BERKELEY, 1523 Somerset Dr., Lynchburg, Va. 24503
- GEORGE R. BERNARD, Dept. of Gross Anatomy, Medical College of Georgia, Augusta, Georgia 30902
- LEWIS BERNER, Dept. of Biology, University of Florida, Gainesville, Fla. 32601
- FREDERICK H. BERRY, Tropical Atlantic Biological Lab., 75 Virginia Beach Drive, Miami, Fla. 33149
- JAMES W. BERRY, Dept. of Zoology, Butler University, Indianapolis, Ind. 46207
- ROBERT J. BEYERS, Bldg. 722-G SR00, Box A, Aiken, S. C. 29801
- JOHN W. BISHOP, Box 248, University of Richmond, Richmond, Va. 23173
- ZOE WELLS BLACK, 1605 Stafford Avenue, Fredericksburg, Va. 22401
- BRENDA C. BLACKWELDER, Dept. of Botany, University of South Carolina, Columbia, S. Car. 29208
- CHARLES B. BLAIR, JR., Department of Anatomy, School of Veterinary Medicine, University of Georgia, Athens, Ga. 30601
- CHARLES E. BLAND, Botany Department, University of North Carolina, Chapel Hill, N. C. 27514
- RONALD WAYNE BLESSING, 226 Barnard Ave., Aiken, S. C. 29801
- KURT E. BLUM, Conradi Building, Florida State University, Tallahassee, Fla. 32306
- DIETRICH BODENSTEIN, 270 Gilmer Hall, Dept. of Biology, University of Virginia, Charlottesville, Va. 22903
- CHARLES N. BOEHMS, Dept. of Biology, Austin Peay State Coll., Clarksville, Tenn. 37040
- DONALD F. BOESCH, Virginia Institute of Marine Science, Gloucester Point, Va. 23062
- BURTON J. BOGITSCH, Box 1733, Station B, Vanderbilt University, Nashville, Tenn. 37203
- HAROLD C. BOLD, Dept. of Botany, University of Texas, Austin, Texas 78712
- MILDRED IRENE BOLIEK, Biology Dept., Coker College, Hartsville, S. C. 29550
- LORA BOND, Dept. of Biology, Drury College, Springfield, Mo. 65802
- ELDON D. BONDS, Department of Biology, Tennessee Wesleyan College, Athens, Tenn. 37303
- THEODORE BOODEN, 1650 Airport Drive, Tallahassee, Fla. 32304
- JOHN ALLEN BOOLE, JR., Division of Science and Mathematics, Georgia Southern College, Statesboro, Ga. 30458
- EDWARD M. BOOTH, 165 Morningview Circle, Athens, Ga. 30601
- HERBERT T. BOSCHUNG, P. O. Box 1927, University, Ala., 35486
- PETER E. BOSTICK, Dept. of Biology, Emory University, Atlanta, Ga. 30322
- H. BRUCE BOUDREAUX, Dept. of Entomology, Louisiana State University, Baton Rouge, La. 70803
- MRS. JULIA H. BOULWARE, 1417 Eisenhower Drive, Columbia, S. C. 29203
- SANDRA T. BOWDEN, 2178 Dering Circle, Atlanta, Ga. 30329
- SHIRLEY WILLIAMS BOWERS, Department of Biology, Chowan College, Murfreesboro, N. C. 27855
- GLENDA BOWNE, Yerkes Primate Research Center, Emory University, Atlanta, Ga. 30322
- ERNEST A. BOYKINS, JR., Box 178, Alcorn A & M College, Lorman, Miss. 39096
- JAMES MCGREGOR BOYLES, University of South Alabama, 307 Gaillard Drive, Mobile, Ala. 36608
- JOHN RUSSELL BOZEMAN, University of N. C., Chapel Hill, North Carolina 27514
- RUSSELL C. BRACHMAN, 122 Beverley Road, Danville, Va. 24541
- ORA C. BRADBURY, 377 Durham Rd., Wake Forest, N. C. 27587
- TED R. BRADLEY, Department of Biology, George Mason College, Fairfax, Va. 22030
- JOSEPH M. BRANHAM, 2538 The Moll, Dept. of Zoology, University of Hawaii, Honolulu, Hawaii 96822
- MARY JANE BRANNON, Dept. of Biology, Huntingdon College, Montgomery, Ala. 36104

- DOUGLAS G. BRAUN, Box 21234, Emory University, Atlanta, Ga. 30322
- DALE CARL BRAUNGART, Dept. of Biology, Catholic Univ. of America, Washington 17, D. C. 20017
- JOHNNIE E. BREEDEN, Rt. 5 Parner Place, Franklin, Tenn. 37064
- RUTH S. BREEN, 1806 E. Croydon Dr., Tallahassee, Fla. 32303
- DAVID ALLEN BREIL, Natural Sciences Department, Longwood College, Farmville, Va. 23901
- DAVID BREIL, Department of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- JOSEPHINE BRIDGMAN, Dept. of Biology, Agnes Scott College, Decatur, Georgia 30030
- WILLIAM E. BRILLHART, Dept. of Biology, Emory University, Atlanta, Georgia 30322
- H. GRADY BRITT, LSU at Alexandria, Alexandria, La. 71301
- NELL E. BRITTAIN, Dept. of Natural Science, Michigan State University, East Lansing, Mich. 48823
- H. R. BROCK, Dept. of Biology, Austin Peay State University, Clarksville, Tenn. 37040
- JACKIE EDWARDS BROCK, Jefferson Davis College, Drawer G, Brewton, Ala. 36426
- FREDERICK W. BROCKMANN, Department of Biology, Pensacola Junior College, Pensacola, Fla. 32504
- CARL DEE BROWN, Biology Department, Memphis State University, Memphis, Tenn. 38111
- E. E. BROWN, Box 343, Davidson, N. C. 28036
- GEORGE GORDON BROWN, Dept. of Zoology & Ent., Iowa State University, Ames, Iowa 50010
- HARRY D. BROWN, Apt. 501, 2401 W. Broadway, Columbia, Mo. 65201
- JACK S. BROWN, Dept. of Biology, Florida State University, Florence, Ala. 35630
- LARRY N. BROWN, Department of Zoology, University of South Florida, Tampa, Fla. 33620
- PAT I. BROWN, JR., P. O. Box 38-608, Miami, Fla. 33138
- RELIS B. BROWN, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- THOMAS D. BROWN, Erskine College, Due West, S. C. 29639
- EDWARD T. BROWNE, JR., Dept. of Biology, Memphis State University, Memphis, Tenn. 38117
- RICHARD C. BRUCE, Western Carolina University, Cullowhee, N. C. 28723
- ROBERT T. BRUMFIELD, Longwood College, Farmville, Va. 23901
- VIRGINIA S. BRYAN, 1108 Watts St., Durham, N. C. 27701
- SHERYL CHIQUILA BRYANT, 931 Kings Grant Drive NW, Atlanta, Ga. 30318
- ROBERT R. BRYDEN, Dept. of Biology, Guilford College, Greensboro, N. C. 27410
- WILLIAM D. BUCHANAN, Department of Biology, Atlanta University, Atlanta, Ga. 30314
- THOMAS P. BUCKELEW, Biology Department, University of South Carolina, Columbia, S. C. 29208
- ALICE L. BULL, Box #633, Hollins College, Hollins, Va. 24020
- MADELINE P. BURBANCK, P. O. Box 15134, Emory University, Atlanta, Ga. 30333
- WM. D. BURBANCK, Box 15134, Emory University, Atlanta, Ga. 30333
- JOHN CARL BURK, Smith College, Northampton, Mass. 01060
- KENNETH D. BURNHAM, Department of Zoology, University of Tennessee, Knoxville, Tenn. 37916
- ROBERT E. BURNS, Georgia Experiment Station, Experiment, Ga. 30212
- DENNIS T. BURTON, Plank & Whitsell Apt. 7, Main Street, Blacksburg, Va. 24060
- JEAN PANTELL BURTON, Dept. of Zoology, University of Georgia, Athens, Ga. 30601
- FRANCIS M. BUSH, Dept. of Anatomy, Medical College of Virginia, Richmond, Va. 23219
- E. E. BYRD, Dept. of Biology, University of Georgia, Athens, Ga. 30601
- JOHN M. BYRD, Box #648, Many, Louisiana 71449
- MITCHELL A. BYRD, Dept. of Biology, College of William and Mary, Williamsburg, Va. 23185
- C**
- JOHN F. CABLER, P. O. Drawer 550, The Village of Golf, Delray Beach, Fla. 33444
- JOHN CAIRNS, JR., Professor of Biology, V. P. I., Blacksburg, Va. 24061
- DAVID K. CALDWELL, Marineland Research Laboratory, Route 1, Box 122, St. Augustine, Fla. 32084
- R. DALE CALDWELL, Department of Biology, Alabama College, Montevallo, Ala. 35115
- FORD CALHOUN, Department of Microbiology, University of Georgia, Athens, Ga. 30601
- MAC A. CALLAHAM, Box 84, Dahlgonega, Ga. 30533
- JAMES THOMAS CALLAHAN, Department of Biology, University of South Carolina, Columbia, S. C. 29208
- THOMAS H. CAMPBELL, Dept. of Biology, College of Steubenville, Steubenville, Ohio 43952
- NYAL DWIGHT CAMPER, Dept. Botany, & Bacteriology, Clemson University, Clemson, S. C. 29631
- PETER G. CANONICO, Dept. of Phys. Biochem, Rutgers University, New Brunswick, N. J. 08903
- DONALD CAPLENOR, Tenn. Polytechnic Institute, Cookeville, Tenn. 38501
- JAMES D. CAPONETTI, Dept. of Botany, University of Tennessee, Knoxville, Tenn. 37916
- ROBERT R. CARDELL, JR., Assoc. Professor of Anatomy, Department of Anatomy, University Va. Medical School, Charlottesville, Va. 22901
- J. GORDON CARLSON, Dept. of Zoology and Entomology, University of Tennessee, Knoxville, Tenn. 37916
- PAUL H. CARLSON, Dept. of Ent. & Zool., Clemson University, Clemson, S. C. 29631
- WILLIAM M. CARLTON, Botany Dept., University of Georgia, Athens, Ga. 30601
- BUCK CARNEY, P. O. Box 886, Cullowhee, N. C. 28723
- I. W. CARPENTER, JR., Dept. of Biology & Geology, Appalachian State Teachers Coll., Boone, No. Car. 28607
- JOHN M. CARPENTER, Dept. of Zoology, University of Kentucky, Lexington, Ky. 40506
- WILLIAM L. CARRIER, Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
- JACK W. CARROLL, P. O. Box 1927, University of Alabama, Tuscaloosa, Ala. 35401
- CHARLES R. CARROW, Dept. of Biology, Guilford College, Greensboro, N. C. 27410

- JACK C. CARTER, Department of Biology, Georgia Southwestern College, Americus, Ga. 31709
- MARJORIE E. CARTER, 1602 Boone Drive, Valdosta, Ga. 31601
- MATILDA CARTLEDGE, C. P. O. 4B3, Berea College, Berea, Ky. 40403
- G. L. CARVER, 1348 Patterson St., Macon, Ga. 31204
- MICHAEL CASTAGNA, Eastern Shore Lab., Va. Inst. of Marine Science, Wachapreague, Va. 23480
- CHARLES A. CATCHING, 1002 Saint John St., Monroe, La. 71201
- CAROL F. CAUDLE, 1685 Alexandria Drive 5-B, Lexington, Ky. 40504
- J. F. CELECIA, Department of Biology, Belmont Abbey College, Belmont, N. C. 28012
- C. S. CHADWICK, P. O. Box KK, Emory and Henry College, Emory, Va. 24327
- N. A. CHAMBERLAIN, Marine Laboratory, Rt. 1, Charleston, S. C. 29407
- MILDRED F. CHAMBERS, Gadsden Jr. College, Gadsden, Ala. 35903
- CLAY M. CHANDLER, Box 29, Bethel College, McKenzie, Tenn. 38201
- PAUL CHANLEY, VIMA, Gloucester Pt., Virginia 23062
- JOE A. CHAPMAN, 210 W. Ellis St., Jefferson City, Tenn. 37760
- JOHN W. CHARTER, JR. Department of Biology, Yancey State College, Bay Minette, Ala. 36507
- KENT E. CHERNETSKI, Department of Zoology, University of Florida, Gainesville, Fla. 32601
- EDWARD W. CHESTER, Department of Biology, Austin Peay State University, Clarksville, Tenn. 37040
- ANN McBRIDE CHILCUTT, 1506 18th Avenue N., Columbus, Miss. 39701
- GEORGE A. CHRISTENBERRY, Dean of the College, Georgia College at Milledgeville, Milledgeville, Ga. 31061
- HELEN CHURCHILL, Hollins College, Virginia 24020
- PATRICK M. CICALA, Department of Biology, Northeast Louisiana State College, Monroe, La. 71201
- FRED E. CLARK, Biology Department, Stetson University, Deland, Fla. 32720
- WILLIE M. CLARK, 3B37 Simpson-Stuart Road, Bishop College, Box 3, Dallas, Texas 75241
- ALLEN B. CLARKSON, JR., Department of Zoology, University of Georgia, Athens, Ga. 30601
- ROY B. CLARKSON, Dept. of Biology, West Virginia University, Morgantown, W. Va. 26505
- DAVID L. CLAYBROOK, Biology Dept., University South Carolina, Columbia, S. C. 29208
- EDWARD E. C. CLEBSCH, Dept. of Botany, University of Tennessee, Knoxville 16, Tenn. 37916
- ANTHONY C. CLEMENT, Dept. of Biology, Emory University, Atlanta, Ga. 30322
- WILL J. CLOYD, Department of Biology, Carson-Newman College, Jefferson City, Tenn. 37760
- G. EUEL COATS, Department (Plant Pathol. & Physiol.) Virginia Polytechnic Institute, Blacksburg, Va. 24061
- E. C. COCKE, Dept. of Biology, Box 7281 Reynolda Station, Wake Forest College, Winston-Salem, N. C. 27106
- JANICE C. COFFEY, Queens College, Charlotte, N. C. 28207
- ADA A. COLE, Zoology Dept., University of Tennessee, Knoxville, Tenn. 37916
- ARTHUR C. COLE, JR., Dept. of Zoology, University of Tennessee, Knoxville, Tenn. 37916
- BENJAMIN T. COLE, 3910 Glenfield Road, Columbia, S. C. 29208
- EVA M. COLE, 616 Beckwith St., SW, Atlanta, Ga. 30314
- EVELYN COLE, Dept. of Biology, Murray State University, Murray, Ky. 42071
- MADISON B. COLE, JR., Dept. of Zoology, University of Tenn., Knoxville, Tenn. 37916
- DAVID C. COLEMAN, Savannah R. Ecological Lab., Bldg. 772-G, Box A, Aiken, S. Car. 29801
- MARION T. COLEMAN, 1284 Oakdale Rd., N.E., Atlanta, Ga. 30307
- ALBERT W. COLLIER, 1622 Seminole Drive, Tallahassee, Fla. 32301
- JOELLA F. COLLIER, Box 525, Pikeville, Kentucky 41501
- RICHARD F. COLLINS, 540 Constitution Street, Norman, Okla. 73069
- WILLIAM E. COLLINS, Lab Parasite Chemotherapy, P. O. Box 80190, Chamblee, Ga. 30005
- CLYDE E. CONNELL, Dept. of Biology, Valdosta State College, Valdosta, Ga. 31601
- MELVIN L. CONRAD, 708 E. Laharpe, Kirksville, Mo. 63501
- MILTON J. CONSTANTIN, UT-AEC-ARL, 1299 Bethel Valley Road, Oak Ridge, Tenn. 37830
- EUGENE W. COOK, Dept. of Biology, Centre College, Danville, Ky. 40422
- MARY JANE COOK, Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
- ARTHUR W. COOPER, Dept. of Botany, North Carolina State College, Raleigh, N. C. 27607
- DONALD E. COPELAND, Biology Dept., Tulane University, New Orleans, La. 70118
- T. P. COPELAND, Dept. of Biology, East Tenn. State College, Johnson City, Tenn. 37601
- EARL L. CORE, Dept. of Biology, West Virginia University, Morgantown, W. Va. 26505
- WILLIAM B. COSGROVE, Dept. of Zoology, University of Georgia, Athens, Ga. 30601
- DAVID J. COTTER, Dept. of Biology, Woman's College of Georgia, Milledgeville, Ga. 31061
- ERNEST F. COUCH, Department of Biology, Texas Christian University, Fort Worth, Texas 76129
- HOUSTON B. COUCH, Department of Plant Pathol. & Physiol., Virginia Polytechnic Institute, Blacksburg, Va. 24061
- JOHN N. COUCH, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514
- RONALD R. COWDEN, L. S. U. Medical Center, Dept. of Anatomy, 1542 Tulane Ave., New Orleans, La. 70112
- LILLIAN MATHESON COWIE, Department of Biology, Wesleyan College, Macon, Ga. 31201
- GERALD T. COWLEY, Dept. of Biology, University of South Carolina, Columbia, S. C. 29208
- EDMOND R. COX, JR., 504 Guille Street, Athens, Tenn. 37303
- DOROTHY L. CRANDALL, Box 27B, Randolph Macon Woman's College, Lynchburg, Va. 24504
- ARDIS L. CRAMER, 1431 Cornell Rd., N.E., Atlanta, Ga. 30306
- CLAUDE C. CRAWFORD, Department of Zoology, North Carolina State University, Raleigh, N. C. 27607

EDWARD A. CRAWFORD, JR., Dept. of Biology, Hampden Sydney College, Hampden Sydney, Va. 23943
 EUGENE CRAWFORD, JR., Dept. Zoology, University of Ky., Lexington, Ky. 40506
 JERRY H. CROMER, Dept. of Biology, Converse College, Spartanburg, S. C. 29301
 D. A. CROSSLEY, Entomology Dept., University of Georgia, Athens, Ga. 30601
 ROBERT H. CROWL, Pfeiffer College, Misenheimer, No. Car. 28109
 W. BOWMAN CRUM, JR., Academy Natural Sciences, Dept. of Limnology, 19th & The Parkway, Philadelphia, Pa. 19103
 PHILIP J. CRUTCHFIELD, Dept. of Biology, Methodist College, Fayetteville, N. C. 28301
 JOHN D. CULBERTSON, Box U-1047, University of S. Carolina, Columbia, S. C. 29208
 FAIRMAN CUMMING, Dept. of Botany, University of N. Carolina, Chapel Hill, N. C. 27515
 DAVID M. CUPKA, Rt. 6, Box 360, N. Charleston, S. C. 29406

D

TOM DAGGY, Box 626, Davidson, N. C. 28036
 MICHAEL D. DAHLBERG, Univ. of Georgia Marine Institute, Sapelo Island, Ga. 31327
 WILLIAM G. DAIL, 7015 Miami Avenue, Richmond, Va. 23226
 EDWIN DALE, GYN/OB Department, School of Medicine, Emory University, Atlanta, Ga. 30303
 CHARLES P. DANIEL, P. O. Box 678, Georgia College, Milledgeville, Ga. 31061
 ROBERT E. DANIEL, Department of Biological Sciences, Murray State University, Murray, Ky. 42071
 EDGAR B. DARDEN, JR., Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
 JULIAN T. DARLINGTON, Dept. of Biology, Southwestern at Memphis, North Parkway, Memphis, Tennessee 38112
 PHILIP H. DARST, Dept. of Entomology, Purdue University, Lafayette, Indiana 47907

PATRICIA A. DAUGHERTY, Biology Dept., East Carolina College, Greenville, N. C. 27834
 LESLIE B. DAVENPORT, JR., 726 Windsor Rd., Savannah, Ga. 31406
 D. GALE DAVIS, Dept. of Genetics, University of Wisconsin, Madison, Wis. 53706
 DAVID E. DAVIS, Box 5577, Raleigh, N. C. 27607
 DONALD A. DAVIS, Box 1812, Station B, Vanderbilt University, Nashville, Tenn. 37203
 GRAHAM J. DAVIS, Dept. of Biology, East Carolina College, Greenville, N. C. 27834
 HERBERT L. DAVIS, JR., Dept. of Biology, Emory University, Atlanta, Ga. 30322
 JOHN E. DAVIS, JR., Dept. of Biology, Madison College, Harrisonburg, Va. 22801
 JOSEPH S. DAVIS, Department of Botany, University of Florida, Gainesville, Fla. 32601
 LUCKETT V. DAVIS, Dept. of Biology, Winthrop College, Rock Hill, S. C. 29730
 WILLIAM M. DAVIS, Hinds Junior College, Raymond, Miss. 39154
 CLINTON J. DAWES, Department of Botany, University of South Florida, Tampa, Fla. 33620
 CHARLOTTE DAWLEY, Dept. of Biology, Univ. of North Carolina, Greensboro, N. C. 27412
 WALLACE D. DAWSON, JR., Dept. of Biology, University of South Carolina, Columbia, S. C. 29208
 JOHN W. DAY, JR., 1 Wyrick Street, Chapel Hill, N. C. 27514
 JOHN WILTON DAY, JR., Drawer FC, University Station, Baton Rouge, La. 70803
 W. M. DEACON, Dept. of Biology, Vanderbilt University, Nashville, Tenn. 37203
 TEMD R. DEASON, P. O. Box 1927, University of Alabama, University, Ala. 35486
 A. GIB DeBUSK, Dept. of Biology Sciences, Florida State University, Tallahassee, Fla. 32306
 R. DEAN DECKER, Department of Biology, University of Richmond, Richmond, Va. 23220
 JAMES N. DENT, Dept. of Biology, 270 Gilmer Hall, University of Virginia, Charlottesville, Va. 22903

JAMES F. DENTON, JR., Medical College of Georgia, Eugene Talmadge Memorial Hospital, Augusta, Ga. 30902
 T. E. DENTON, Dept. of Biology, Samford University, Birmingham, Ala. 35209
 CHARLES F. DePOE, Dept. of Biology, Northeast Louisiana State, Monroe, La. 71201
 HENRY R. DeSELM, Dept. of Botany, University of Tennessee, Knoxville, Tenn. 37916
 JAMES B. DEWAR, JR., Department of Science, Chowan College, Murfreesboro, N. C. 27855
 ROBERT M. DEWITT, Dept. of Zoology, University of Florida, Gainesville, Fla. 32601
 STEVE C. DIAL, Box 6, Misenheimer, N. C. 28109
 JOSHUA C. DICKINSON, JR., Florida State Museum, University of Florida, Gainesville, Fla. 32601
 URBAN L. DIENER, Dept. of Botany, Auburn University, Auburn, Ala. 36830
 R. A. DIETZ, Troy State College, Troy, Ala. 36081
 GARY DILLARD, Dept. of Biology, Western Kentucky University, Bowling Green, Ky. 42101
 JOHN F. DIMMICK, 2860 Wesleyan Lane, Winston-Salem, N. C. 27106
 BEVERLY ANN DIXON, Box 77, Atlanta University, Atlanta, Ga. 30314
 JAMES A. DOUBLES, Dept. of Biology, Birmingham Southern College, Birmingham, Ala. 35204
 MARYBRUCE L. DOWD, Dept. of Biology, Richmond Professional Inst., Richmond, Va. 23220
 BOBBY F. DOWDEN, 8515 Youree Drive, Shreveport, La. 71105
 LAURA M. DOYLE, 365 Hawthorn Ave., Palo Alto, Calif. 94301
 DONALD J. DRAPALIK, Botany Dept., University of North Carolina, Chapel Hill, N. C. 27514
 ROBERT F. DRESCHER, 977 Queens Drive, Yardley, Pa. 19067
 LIBBY DREW, Department of Biology, Shorter College, Rome, Ga. 30161
 SUSANNA C. DUDLEY, Mote Marine Laboratory, 9501 Blind Pass Road, Sarasota, Fla. 33581
 MICHAEL J. DUEVER, Institute of Ecology, Rockhouse, University of Georgia, Athens, Ga. 30601

THOMAS WADE DUKE, Pollution Studies Program, BCF Radiobiological Laboratory, Beaufort, No. Car. 28516
 SUE H. DUNCAN, 5710 San Juan Apt. 39, Jacksonville, Fla. 32210
 WILBUR H. DUNCAN, Dept. of Botany, University of Georgia, Athens, Ga. 30601
 DOLORES S. DUNDEE, Dept. of Biology, LSU in New Orleans, New Orleans, La. 70122
 MARY C. DUNN, Box 344, Middle Tenn. State College, Murfreesboro, Tenn. 37130

E

SYLVIA A. EARLE, Farlow Herbarium, Harvard University, Cambridge, Mass. 02138
 BRUCE M. EBERHART, Dept. of Biology, University of North Carolina, Greensboro, N. C. 27412
 JOE ALLEN EDMISTEN, Botany Dept., University of Georgia, Athens, Georgia 30601
 JANICE M. EDWARDS, 729 King Street, Columbia, S. C. 29205
 KIAH EDWARDS, JR., 159 Webster St., Atlanta, Ga. 30314
 MARY JANE EDWARDS, Box 686, Western Carolina University, Cullowhee, N. C. 28723
 DONNA MARIE EGGERS, Box 340, Station B, Vanderbilt Univ., Nashville, Tenn. 37203
 WILLIS A. EGGLE, Dept. of Biology, Newcomb College of Tulane University, New Orleans, La. 70118
 WARREN K. EHIHART, 5235 Vann St., Raleigh, N. Car. 27607
 WILLIAM W. ELAM, P. O. Drawer FD, State College, Miss. 39762
 NANCY B. ELIASON, Box 32, Campbell College, Buies Creek, N. C. 27506
 LESLIE L. ELLIS, Dept. of Zoology, Mississippi State Univ., State College, Miss. 39762
 WILLIAM H. ELLIS, Dept. of Biology, Austin Peay State College, Clarksville, Tenn. 37040
 WILLIAM L. ELLISON, Erskine College, Due West, S. Carolina 29639
 FRED W. EMERSON, Box 483, Elon College, N. C. 27244
 LYMAN R. EMMONS, Dept. of Biology, Washington & Lee University, Lexington,

ton, Va. 24450
 ROBERT B. ENGLAND, Dept. of Biology, West Georgia College, Carrollton, Ga. 30117
 WILLIAM G. ERWIN, NSC Box 4237, Northwestern State College, Natchitoches, La. 71457
 GERALD W. ESCH, Department of Biology, Wake Forest University, Winston-Salem, N. C. 27106
 EDNA ESTES, 522 N. Alabama Avenue, Salisbury, Md. 21801
 ALBERT LOUIS ETHERIDGE, Dept. of Zool. and Physiol., Louisiana State Univ., Baton Rouge, La. 70803
 DAVID A. ETNIER, Dept. of Zoology & Entomology, University of Tennessee, Knoxville, Tenn. 37916
 A. MURRAY EVANS, Botany Dept., University of Tenn., Knoxville, Tenn. 37916
 W. BRUCE EZELL, Dept. of Zoology, Clemson University, Clemson, S. C. 29631

F

GILBERT W. FAIRBANKS, Furman University, Greenville, South Carolina 29613
 WAYNE R. FAIRCLOTH, Dept. of Biology, Valdosta State College, Valdosta, Georgia 31601
 W. H. FARLEY, Tennessee Technological University, Cookeville, Tenn. 38501
 CHARLES E. FARRELL, Department of General Biology, Vanderbilt University, Nashville, Tenn. 37203
 W. D. FATTIG, Dept. of Biology, Southwestern at Memphis, Memphis, Tenn. 38112
 DEATON F. FAUCETTE, Dept. of Math & Science, Chowan College, Murfreesboro, N. Car. 27855
 JACK H. FEHON, Queens College, Charlotte, N. Car. 28207
 VICTOR E. FEISAL, Biology Department, Memphis State University, Memphis, Tenn. 38111
 HOLLIS C. FENN, Department of Science, Florence State College, Florence, Ala. 35630
 JAMES F. FERRY, Dept. of Biology, Madison College, Harrisonburg, Va. 22801
 ROBERT H. FETNER, School of Biology, Georgia Institute Tech., Atlanta, Ga. 30332

HOWARD M. FIELD, Department of Biology, Florida Southern College, Lakeland, Fla. 33802
 JACQUELINE E. FINCH, 224 Chickamauga Ave., SW, Atlanta, Ga. 30314
 JOHN A. FINCHER, Samford University, Birmingham, Ala. 35209
 MILTON FINGERMAN, Dept. of Biology, Tulane University, New Orleans, La. 70118
 PAUL L. FISHER, 157 Duncan Chapel Road, Greenville, S. C. 29609
 JOSEPH F. FITZPATRICK, JR., Dept. of Zoology, Mississippi State University, State College, Miss. 39762
 R. O. FLAGG, Carolina Biological Supply Co., Burlington, N. C. 27215
 DIANE O. FLEMING, 5392 Mesquite Road, Memphis, Tenn. 38117
 HARVEY W. FLEMING, Shaw High School, Shaw, Mississippi 38773
 LAURENCE E. FLEMING, Box 672, Blackburg, Va. 24060
 FRANKLIN F. FLINT, Dept. of Biology, Randolph Macon Woman's College, Lynchburg, Va. 24503
 W. S. FLORY, Box 7325, Reynolda Station, Winston-Salem, N. Car. 27109
 JOHN R. FOLEY, Department of Biology, University of South Carolina, Columbia, S. C. 29208
 BENNIE R. FORD, Department of Biology, Samford University, Birmingham, Ala. 35209
 FLOYD M. FORD, Dept. of Biology, Austin Peay State College, Clarksville, Tenn. 37040
 CHARLES W. FOREMAN, University of the South, Sewanee, Tenn. 37375
 W. WAYNE FORMAN, 1657 South Acadian Thruway, Baton Rouge, La. 70808
 NEAL R. FOSTER, Dept. of Limnology, Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103
 WILLIAM A. FOSTER, Department of Botany, North Carolina State University, Raleigh, N. C. 27607
 RICK FOWLKES, Department of Biology, Austin Peay State University, Clarksville, Tenn. 37040
 MRS. EDGAR W. FRANCISCO, III, Rwordi Drive, No. Branford, Conn. 06471
 DIRK FRANKENBERG, University of Georgia Marine Institute, Sapelo Island, Ga. 31327
 BERYL C. FRANKLIN, Dept. of Biology,

- Northeast Louisiana State College, Monroe, La. 71201
- RENTY B. FRANKLIN, Department of Biology, St. Augustine's College, Raleigh, N. C. 27602
- RONALD C. FRASER, Dept. of Zoology, University of Tennessee, Knoxville, Tenn. 37916
- LAFAYETTE FREDERICK, Dept. of Biology, Atlanta University, Atlanta, Ga. 30314
- CARL J. FREEMAN, JR., Presbyterian College, Department of Biology, Clinton, S. C. 29325
- CHARLOTTE C. FREEMAN, Dept. of Biology, University of Chattanooga, Chattanooga, Tenn. 37403
- JOHN A. FREEMAN, Winthrop College, Rock Hill, S. C. 29730
- JOHN D. FREEMAN, Box 207, Station B, Vanderbilt University, Nashville, Tenn. 37203
- JOHN R. FREEMAN, Dept. of Biology, University of Chattanooga, Chattanooga, Tenn. 37403
- SALLIE B. FREEMAN, 4741 N.W. 8th Avenue, Gainesville, Fla. 32601
- RUSKIN S. FREER, 1158 Timber Lake Drive, Lynchburg, Va. 24502
- JAMES J. FRIAUF, Box 1612, Station B, Dept. of Biology, Vanderbilt University, Nashville, Tenn. 37203
- MARGARET B. FRIEND, 4888 Jett Road, N.W., Atlanta, Georgia 30327
- WILLIAM R. FRYAR, 1330 N.W. 55th Street, Gainesville, Fla. 32601
- IRIS BONITA FRYE, 2756 Lincoln Court, NW, Atlanta, Ga. 30318
- CHARLES M. FUGLER, JR., Dept. of Zoology, Auburn University, Auburn, Ala. 36830
- D. L. FULLER, Stetson University, Deland, Fla. 32720
- RUDOLPH SILAS FULTON, Box 971, Eastern Ky. State University, Richmond, Ky. 40475
- ROBERT A. FUSCO, 101 Walker Laboratory, Pennsylvania State University, University Park, Pa. 16801
- G**
- JOHN J. GALLAGHER, 191 Utica Street, Brockport, N. Y. 14420
- FRED C. GALLE, Callaway Gardens, Pine Mountain, Ga. 31822
- ARTHUR R. GARRETT, JR., 3030 Vaughn Road, Montgomery, Ala. 36106
- NANCY N. GARRETT, 3030 Vaughn Road, Montgomery, Ala. 36106
- WILLIAM R. GARRETT, Department of Biology, Emory University, Atlanta, Ga. 30322
- NORMAN E. GARRISON, 160 Colonial Dr., Apt. A, Harrisonburg, Va. 22801
- RICHARD E. GARTH, Dept. of Biological Sci., Mississippi State Coll. for Women, Columbus, Miss. 39701
- GLENN B. GATIPON, Dept. of Physiology, La. State Medical School, 1542 Tulane Ave., New Orleans, La. 70112
- MARY ESTHER GAULDEN, Radiology Dept., Univ. of Texas S.W. Med. School, 5323 Harry Hines Blvd., Dallas, Texas 75235
- M. A. GENOVESE, W/AF5KRT, 1316 South Court Street, Opelousas, La. 70570
- DAN U. GERSTEL, Crop Science Department, N. C. State University, Raleigh, N. C. 27607
- J. WHITFIELD GIBBONS, Savannah River Ecology Laboratory, Box A, SROO, Aiken, S. C. 29801
- VERNON D. GIFFORD, Dept. of Secondary Ed., Miss. State Coll., State College, Miss. 39762
- MARGARET L. GILBERT, Dept. of Biology, Florida Southern College, Lakeland, Florida 33802
- JUDITH MARSHA GILES, Department of Biology, Agnes Scott College, Decatur, Ga. 30030
- LAUREN C. GILMAN, Dept. of Biology, University of Miami, Coral Gables, Fla. 33124
- JOHN FREDERICK GIPSON, Box 153, George Peabody College, Nashville, Tenn. 37203
- STEPHEN M. GITTLESON, Dept. of Zoology, Univ. of Kentucky, Lexington, Ky. 40506
- JEAN J. GIVENS, Georgia State College, 33 Gilmer St., S.E., Atlanta, Ga. 30303
- SANDRA J. GLOVER, 180 Bloomfield, Apt. B-1, Athens, Ga. 30601
- ROBERT K. GODFREY, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- COLEMAN J. GOIN, Dept. of Biology, University of Florida, Gainesville, Fla. 32601
- LEWIS C. GOLDSTEIN, Richmond Professional Institute, 901 W. Franklin St., Richmond, Va. 23220
- ROBERT JAY GOLDSTEIN, Department of Biology, Emory University, Atlanta, Ga. 30322
- FRANK B. GOLLEY, Institute of Ecology, Rockhouse, University of Georgia, Athens, Ga. 30601
- CHAUNCEY G. GOODCHILD, Emory University, Atlanta, Ga. 30322
- JAMES T. GOODWIN, Dept. of Zoology, University of Tennessee, Knoxville, Tenn. 37916
- ROBERT E. GORDON, Dept. of Biology, University of Notre Dame, Notre Dame, Ind. 46556
- CHERLYN SUE GRANROSE, Biological Sciences Building, University of Georgia, Athens, Ga. 30601
- ROBERT REDINGTON GRANT, JR., Academy of Natural Sciences, 19th & The Parkway, Phila., Pa. 19103
- IRVING E. GRAY, Zoology Dept., Duke University, Durham, North Carolina 27706
- NETTA E. GRAY, Agnes Scott College, Decatur, Ga. 30030
- STEPHEN W. GRAY, Dept. of Anatomy, Emory University, Atlanta, Ga. 30322
- PHILIP C. GREAR, Dept. of Biology, Shorter College, Rome, Ga. 30161
- MARGARET GREEN, 118 Pine Street, Carrboro, N. C. 27510
- WILBERT GREENFIELD, Jackson State College, Jackson, Miss. 39217
- KENNETH W. GREGG, 521 Anastasia Ave., Coral Gables, Fla. 33134
- VICTOR A. GREULACH, Dept. of Botany, Univ. of North Carolina, Chapel Hill, N. C. 27514
- BEA GRIFFIN, RFD 2, Ochlochnee, Ga. 31773
- MILDRED M. GRIFFITH, Dept. of Botany, University of Florida, Gainesville, Fla. 32601
- KENNETH E. GRISWOLD, JR., Lot 53, 3411 Two Notch Road, Columbia, S. C. 29204
- ARNOLD B. GROBMAN, Dean, College of Arts & Sciences, Rutgers Univ., New Brunswick, N. J. 08902
- ROBERT M. GRODNER, Dept. of Food & Science & Technology, Louisiana State University, Baton Rouge, La. 70802
- NANCY P. GROSECLOSE, Dept. of Biology, Agnes Scott College, Decatur, Ga. 30030
- E. O. GRUNDSET, Biology Department, Southern Missionary College, Collegedale, Tenn. 37315
- WILLIAM D. GUDE, 128 Pembroke Road, Oak Ridge, Tenn. 37830

OSCAR WILMONT GUPTON, Dept. Biology, Virginia Military Institute, Lexington, Va. 24450

H

- JOHN G. HAESLOOP, Dept. of Biology, Pfeiffer College, Misenheimer, N. C. 28109
- MASON E. HALE, JR., Dept. of Botany, Smithsonian Institution, Washington, D. C. 20560
- TERRENCE M. HAMMILL, 133 Smalley Road, University Heights, Syracuse, N. Y. 13210
- CAROLYN H. HAMPTON, Dept. of Science Ed., East Carolina St. Coll., Greenville, N. Car. 27834
- RICHARD T. HANLIN, Dept. of Plant Pathology, University of Georgia, Athens, Ga. 30601
- KEITH L. HANSEN, 627 East Minnesota Ave., Deland, Florida 32720
- JAMES W. HARDIN, Dept. of Biology, Memphis State University, Memphis, Tenn. 38111
- JAMES W. HARDIN, Dept. of Botany, North Carolina State College, Raleigh, N. C. 27607
- GLADYS SHIRLEY HARDY, Jackson State College, Jackson, Miss. 39217
- G. T. HARGITT, 811 Watts St., Durham, N. Car. 27701
- RICHARD HARKEMA, Dept. of Zoology, N. Car. State University, Raleigh, N. Car. 27607
- WALTER J. HARMAN, Dept. of Zoology, Louisiana State University, Baton Rouge, La. 70803
- R. M. HARPER, Box O, University, Ala. 35486
- ALVA H. HARRIS, Dept. of Biology, Nicholls State College, Thibodaux, La. 70301
- ELIZABETH HARRIS, 1121 Harbert St., Tallahassee, Fla. 32303
- J. P. HARRIS, Dept. of Math & Science, Chowan College, Murfreesboro, N. Car. 27855
- THOMAS M. HARRIS, Medical College of Virginia, Richmond, Va. 23219
- ANTONIO E. HARRISE, Department of Biology, Box 148, University of Southern Mississippi, Hattiesburg, Miss. 39401
- DALE E. HARRISON, Dept. of Biology, Wilmington College, Wilmington, N. Car. 28401
- FREDERICK W. HARRISON, Biology Department, Presbyterian College, Clinton, S. C. 29325
- JULIAN R. HARRISON, III, Dept. of Biology, College of Charleston, Charleston, S. C. 29401
- CHARLES W. HART, JR., Academy of Natural Sciences, 19th and Parkway, Phila., Pa. 19103
- GARY HARTSHORN, Department of Botany, N. C. State, Raleigh, N. C. 27607
- MICHAEL J. HARVEY, Dept. of Biology, Memphis St. University, Memphis, Tenn. 38111
- RAYMOND S. HARVEY, 110 Idlewild Dr., Aiken, S. C. 29801
- A. M. HARVILL, JR., Dept. of Nat. Sci., Longwood College, Farmville, Va. 23901
- E. A. HATFIELD, 967 Juniper St., NE, Atlanta, Ga. 30309
- EDWARD S. HATHAWAY, 1423 Jefferson Ave., New Orleans, La. 70115
- ROBERT R. HAUBRICH, Dept. of Biology, Denison University, Granville, Ohio 43023
- MARVIN R. HAWES, Western Piedmont Community College, Morgantown, N. C. 28655
- DONALD H. HAYES, Box 576, Southeastern Louisiana Coll., Hammond, La. 70401
- JOHN T. HAYES, Savannah River Ecology Lab, Bldg. 722-G, USAEC, SROO, P. O. Box A, Aiken, S. C. 29801
- DON W. HAYNE, Inst. of Statistics, N. C. State University, Raleigh, N. Car. 27607
- CURRY T. HAYNES, Dept. of Biology, Oxford College, Oxford, Ga. 30267
- F. ALLAN HAYSE, Department of Biology, Samford University, 800 Lakeshore Drive, Birmingham, Ala. 35209
- PHILIP HAYSMAN, Dept. of Bacteriology, University of Georgia, Athens, Ga. 30601
- ALAN G. HEATH, Dept. of Biology, V. P. I., Blacksburg, Va. 24061
- NATILIE HEADRICK, Dept. of Zoology, University of Tennessee, Knoxville, Tenn. 37916
- EDWIN A. HEBB, P. O. Box 70, Marianna, Fla. 32446
- HERBERT HECHENBLEIKNER, Box 12665, Biology Dept., University of North Carolina, Charlotte, N. C. 28205
- DALE HEIN, Dept. Fishery & Wildlife Biology, Colorado State University, Ft. Collins, Colo. 80521
- ANTHONY E. HELGER, Department of Biology, University of South Carolina, Columbia, S. C. 29208
- ELLEN P. HELLWIG, Dept. of Botany, Clemson University, Clemson, S. C. 29631
- MARY C. HELMS, Box 2693, Dept. of Biology, East Carolina College, Greenville, No. Carolina 27834
- KENNETH W. HEMMERLY, Department of Biology, Middle Tennessee State University, Murfreesboro, Tenn. 37130
- A. F. HEMPHILL, 4251 Gentilly Lane, Mobile, Ala. 36618
- BENNYE S. HENDERSON, 4308 O'Bannon Dr., Jackson, Miss. 39213
- JAMES HENDERSON, Department of Biology, Tuskegee Institute, Tuskegee Institute, Ala. 36088
- VERNON HENDERSON, Box 376, Grambling, La. 71245
- JAMES W. HENDRIX, Dept. of Plant Pathology, University of Kentucky, Lexington, Ky. 40506
- CARL E. HENRICKSON, Dept. of Botany, University of Kentucky, Lexington, Ky. 40506
- C. HENRY, Box 1, Honeoye, N. Y. 14471
- J. ROBERT HERFORD, Department of Botany, University of Georgia, Athens, Ga. 30601
- HENRY R. HERMANN, JR., Department of Entomology, University of Georgia, Athens, Ga. 30601
- PATRICIA WATT HERMANN, School of Vet. Medicine, Dept. of Pathology & Parasitology, University of Georgia, Athens, Ga. 30601
- W. R. HERNDON, College of Liberal Arts, University of Tennessee, Knoxville, Tenn. 37916
- J. M. HERR, JR., Dept. of Biology, University of South Carolina, Columbia, S. C. 29208
- ARTHUR L. HERSHEY, c/o Science Department, Florence State College, Florence, Ala. 35630
- L. R. HESLER, College of Liberal Arts, University of Tennessee, Knoxville, Tenn. 37916
- MARGARET HESS, 2933 Kingsland Road, Richmond, Va. 23234
- WALTER N. HESS, Dept. of Biology, Converse College, Spartanburg, S. C. 29301

- L. A. HETRICK, 1614 N.W. 12th Rd., Gainesville, Fla. 32601
- A. N. J. HEYN, Dept. of Biology, LSU at New Orleans, New Orleans, La. 70112
- DON W. HICKMAN, Dept. of Natural Sciences, The State University College, Potsdam, N. Y. 13676
- VIOLET A. HICKS, Dept. of Botany, Univ. of N. Car., Chapel Hill, N. Car. 27514
- ROBERT P. HIGGINS, Dept. of Biology, Wake Forest University, Winston-Salem, N. C. 27109
- PHILIP E. HILDRETH, Department of Biology, University of North Carolina, Charlotte, N. C. 28205
- BEN H. HILL, 333 S. Fifth St., Williamsburg, Ky. 40769
- DAVID RICHARD HILL, 519 E. 13th Street, Bowling Green, Ky. 42101
- JOSEPH L. HINDMAN, Department of Botany, University of Georgia, Athens, Ga. 30601
- HAROLD R. HINDS, Wright Road R.F.D., Collinsville, Conn. 06022
- HORTON H. HOBBS, JR., 3438 Mansfield Road, Falls Church, Va. 22041
- HORTON H. HOBBS, III, 247 Luxury Mobile Homes, Starkville, Miss. 39759
- JANET HODGE, 600 Fairfax Street, Apt. 1, Radford, Va. 24141
- RICHARD L. HOFFMAN, Department of Biology, Radford College, Radford, Va. 24141
- G. RICHARD HOGAN, Department of Biology, University of North Carolina, Charlotte, N. C. 28205
- WILLIAM T. HOGARTH, Box 5577, Dept. of Zoology, North Carolina State University, Raleigh, N. Car. 27607
- JEAN M. HOLBERT, P. O. Box 962, Islamorada, Fla. 33036
- ALEXANDER HOLLAENDER, Biology Division, P. O. Box Y, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
- CHARLES W. HOLLAND, 3700 Sutherland Ave., Apt. S-12, Knoxville, Tenn. 37919
- JAMES R. HOLLER, Dept. of Biology, University of S. C., Columbia, S. C. 29208
- DAN C. HOLLIMAN, Department of Biology, Birmingham Southern College, 800 8th Avenue West, Birmingham, Ala. 35204
- FELICIA H. HOLLINGSWORTH, 994 Gaylemon Circle, Decatur, Ga. 30033
- HARRY LEE HOLLOWAY, JR., Dept. of Biology, Roanoke College, Salem, Va. 24153
- JOE HOLLYFIELD, Hulbrecht Laboratory, Utrecht, Holland
- JAMES R. HOLMAN, Dept. of Entomology, Clemson University, Clemson, S. C. 29631
- JOHN R. HOLSINGER, Dept. of Biology, Old Dominion College, Norwalk, Va. 23508
- JANE P. HOLT, Dept. of Biology, Presbyterian College, Clinton, S. C. 29325
- PERRY C. HOLT, Dept. of Biology, Virginia Polytechnic Institute, Blacksburg, Va. 24061
- K. ELIZABETH HOOD, Department of Biology, Emory University, Atlanta, Ga. 30322
- W. S. HOOKS, Department of Biology, Lynchburg College, Lynchburg, Va. 24504
- ROBERT C. HOPE, Box 293, Buies Creek, No. Carolina 27506
- SAMUEL LINTON HOPKINS, Dept. of Biology, Barber-Scotia College, Concord, N. C. 28025
- GEORGE HORTON, Entomology and Omithology Section, University of Tennessee, Martin Branch, Martin, Tenn. 38237
- JAMES H. HORTON, Dept. of Botany, Western Carolina College, Cullowhee, N. C. 28723
- DONALD E. HOSS, Radiobiological Lab., Bureau of Comm. Fisheries, Beaufort, N. C. 28516
- HERBERT W. HOUSE, JR., Box U-2063, University S. C., Columbia, S. C. 29208
- MARTIN R. HOUSTON, Department of General Biology, Vanderbilt University, Nashville, Tenn. 37203
- H. BRANCH HOWE, JR., Dept. of Bacteriology, University of Georgia, Athens, Ga. 30601
- JOSEPH C. HOWELL, Dept. of Zoology and Entomology, University of Tennessee, Knoxville, Tenn. 37916
- THELMA HOWELL, Highlands Biological Station, Highlands, N. C. 28741
- WILLIAM B. HUBBARD, Box 43, Wofford Coll., Spartanburg, S. C. 29301
- CLARKE HUDSON, Department of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- JOSEPH CLARKE HUDSON, Biological Science Department, Florida State Univ., Tallahassee, Fla. 32306
- CECILE HUGGINS, 2602 Blossom Street, Columbia, S. C. 29205
- MARYANNE R. HUGHES, Dept. of Zoology, University of British Columbia, Vancouver 8, Canada
- H. L. HULL, Dept. of Biology, Box 723, Berea College, Berea, Ky. 40403
- ROBERT W. HULL, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- H. J. HUMM, Marine Science Center, University of South Florida, Bayboro Harbor, St. Petersburg, Fla. 33701
- A. A. HUMPHRIES, JR., Dept. of Biology, Emory University, Atlanta, Ga. 30322
- R. L. HUMPHRIES, 1611 Milford Church Road, Route #5, Marietta, Ga. 30060
- LOUIS R. HUNDLEY, Dept. of Biology, V. M. I., Lexington, Va. 24450
- MAEBURN B. HUNNEYCUTT, Dept. of Biology, University of Mississippi, University, Miss. 38677
- ERNEST L. HUNT, Dept. of Biology, Emory University, Atlanta, Ga. 30322
- GORDON E. HUNT, Department of Botany, University of Tennessee, Knoxville, Tenn. 37916
- GEORGE W. HUNTER, III, Sun City Center, P. O. Box 5418, Florida 33570
- GORDON E. HUNTER, Box 104 A Tennessee Technological University, Cookeville, Tenn. 38501
- ROY HUNTER, JR., Biology Department, Atlanta University, Atlanta, Ga. 30314
- WANDA S. HUNTER, Dept. of Zoology, Duke University, Durham, North Carolina 27706
- M. PATRICIANNE HURD, 1175 Bell Avenue, East Point, Ga. 30044
- SISTER MAUREEN PERPETUA HURLEY, 3912 Pine Street, New Orleans, La. 70125
- LADLEY HUSTED, University of Virginia, Biology Dept., Gilmer Bldg., Charlottesville, Va. 22903
- WILLIAM HUTT, A-213 University Village, Area #1, Athens, Ga. 30601
- DIANNE SUE IMHOFF, 3107 N. Damen Ave., Chicago, Ill. 60618
- ROBERT M. INGLE, State Board of Conservation, Tallahassee, Fla. 32304

J. D. IVES, Pinebluff, North Carolina 28373

WM. DIXON IVEY, Dept. of Zoology and Entomology, Auburn University, Auburn, Ala. 36830

J

C. G. JACKSON, JR., Dept. of Biological Sciences, Miss. State College — Women, Columbus, Miss. 39701

JOHNNY JACKSON, Dept. of Biology, Atlanta University, Atlanta, Georgia 30314

MARGUERITE McMILLAN JACKSON, Dept. of Biological Sciences, Miss. State College for Women, Columbus, Miss. 39701

RACHAEL P. JACKSON, 237 North Blvd., Deland, Fla. 32720

JACQUELINE E. JACOBS, 5854 Woodvine Road, Columbia, S. C. 29206

CHARLES W. JAMES, Dept. of Botany, University of Georgia, Athens, Ga. 30601

FREDERICK C. JAMES, 100 Hanna St., Carrboro, N. C. 27510

GEORGE W. JEFFERS, Dept. of Biology, Longwood College, Farmville, Va. 23901

GEOFFREY M. JEFFERY, 6516 Wilmet Road, Bethesda, Maryland 20034

JACKSON E. JEFFREY, Richmond Professional Institution, 901 W. Franklin St., Richmond, Va. 23220

DONALD B. JEFFREYS, Biology Dept., East Carolina College, Greenville, N. C. 27834

MARIE M. JENKINS, Box 188, Madison College, Harrisonburg, Va. 22801

CHAS. EDWIN JENNER, Dept. of Zoology, Box 429, University of North Carolina, Chapel Hill, N. C. 27514

WILLARD L. JINKS, Rt. 2, Box 230, Proctorville, Ohio 45669

FRED L. JOHNS, Dept. of Zoology, N. C. State University, Box 5577, Raleigh, N. Car. 27607

A. S. JOHNSON, JR., Department of Zoology, University of Georgia, Athens, Ga. 30601

CLYDE E. JOHNSON, JR., Department of Biology, Clark College, Atlanta, Ga. 30314

JUNE C. JOHNSON, 157 Heaton Park Drive, Atlanta, Ga. 30307

THOMAS L. JOHNSON, Apt. E, Lucas Apts., Fredericksburg, Va. 22401

T. W. JOHNSON, Dept. of Botany, Duke University, Durham, N. C. 27706

ALICE S. JONES, Tulip Tree House, Apt. 303, Bloomington, Indiana 47401

ARTHUR W. JONES, Dept. of Zoology and Entomology, University of Tennessee, Knoxville, Tenn. 37916

CLARA L. JONES, 2465 Harvard, 101, San Angelo, Texas 76901

DONALD JONES, Department of (Plant Pathol. & Physiol.), Virginia Polytechnic Institute, Blacksburg, Va. 24061

DUVALL A. JONES, Dept. Biological Sciences, Carnegie-Mellon University, Pittsburgh, Pa. 15213

E. RUFFIN JONES, JR., College of Arts & Sciences, University of Florida, Gainesville, Fla. 32601

RUTH McCLUNG JONES, 410 Ponderosa Ave., Corvallis, Ore. 97330

HARRY G. M. JOPSON, Bridgewater College, Bridgewater, Va. 22812

K

DONALD W. KAUFMAN, Department of Zoology, University of Georgia, Athens, Ga. 30601

DAVID T. KEE, Department of Biology, Northeast Louisiana State College, Monroe, La. 71201

PATRICIA KELLEY KEEFE, Dept. of Biology, Eastern Ky. University, Richmond, Ky. 40475

THOMAS L. KEEFE, Box 851, Eastern Kentucky University, Richmond, Kentucky 40475

CLYDE E. KEELER, Box # 325 Research Dept., Milledgeville State Hospital, Milledgeville, Ga. 31061

GEORGE W. KEITT, JR., Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306

B. J. KELLEY, JR., Emory University, Atlanta, Ga. 30322

CHARLES A. KELLEY, Old Leeds Rd., Rt. 4, Box 8, Birmingham, Ala. 35210

ROBERT W. KELLY, Biology Department, Furman University, Greenville, S. C. 29613

GEORGE C. KENT, JR., Dept. of Zoology, Louisiana State University, Baton Rouge, La. 70803

JEAN KERSCHNER, Western Maryland College, Westminster, Md. 21157

REX E. KERSTETTER, Department of Biology, Furman University, Greenville, S. C. 29613

JAMES A. KERWIN, 292 Remington St., Rochester, N. Y. 14621

MRS. JOHANNA O. KILLOY, Cardinal Newman H. S., 4701 Forest Drive, Columbia, S. C. 29204

RICHARD F. KIMBALL, Biology Division, P. O. Box Y, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830

DAN KIMBROUGH, 11201 Birchcrest Road, Richmond, Va. 23229

JAMES W. KIMBROUGH, Department of Botany, University of Florida, Gainesville, Fla. 32601

G. C. KINGSLAND, Dept. of Bio. & Bact., Clemson University, Clemson, S. C. 29631

DANIEL E. KIRK, Biology Dept., Catawba College, Salisbury, N. C. 28144

PAUL W. KIRK, JR., 1311 Crestview Dr., Blacksburg, Va. 24061

JAMES B. KIRKWOOD, 4103 Fairfax Drive, Columbus, Ohio 43221

ROY S. KISER, 221 Coosawattee Ave., Rome, Ga. 30161

RAYMOND L. KISNER, Science Department, Troy State University, Troy, Ala. 36081

M. KATHLEEN KLIMKIEWICZ, Box 632, Hollins College, Hollins, Va. 24020

WM. JULIAN KOCH, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514

GARY KOCHERT, Department of Botany, University of Georgia, Athens, Ga. 30601

ROBERT KRAL, Dept. of General Biology, Vanderbilt University, Nashville, Tenn. 37203

PAUL J. KRAMER, Dept. of Botany, Duke University, Durham, N. C. 27706

WAYNE A. KRISSINGER, Department of Biology, Georgia Southern College, Statesboro, Ga. 30458

JEROME O. KRIVANEK, Division of Natural Science, University of South Florida, Tampa, Fla. 33620

ROBIN C. KRIVANEK, University of South Florida, Tampa, Fla. 33620

DWAYNE N. KRUSE, Dept. of Biological Sciences, Northwestern State College, Natchitoches, La. 71457

ROBERT A. KUEHN, Dept. of Zoology, University of Kentucky, Lexington, Ky. 40506

DONALD C. KUNZE, Box 4195, Roanoke, Va. 24015

ELLIOT KURZIUS, Dateline in Science,

Inc., 575 Madison Avenue, New York,
N. Y. 10022

L

- S. K. LAFFODAY, c/o Dept. of Biology,
De Kalb College, Clarkston, Ga. 30021
ALLEN L. LAKE, Box 782, Morehead
State College, Morehead, Ky. 40351
WILLIAM T. LAMMERS, Box 607, David-
son College, Davidson, N. C. 28036
ROBERT K. LAMPTON, Dept. of Biology,
West Georgia College, Carrollton, Ga.
30117
JAMES F. LANDT, Dept. of Biology, Ox-
ford College of Emory Univ., Oxford,
Ga. 30267
PETER C. LANE, Jackson State College,
Jackson, Miss. 39217
ROBERT L. LANE, Botany Dept., Univ.
of Georgia, Athens, Ga. 30601
ALBERT A. LATINA, 311A Science Bldg.,
University of South Florida, Tampa,
Fla. 33620
FELIX H. LAUTER, Department of Biolo-
gy, University of S. C., Columbia,
S. C. 29208
PAMELA W. LAWRENCE, Route 1,
Alpharetta, Ga. 30201
WILLIAM LAZARUK, 219 Greenway St.,
Cedarwood, Jamestown, No. Car.
27282
WILLIAM LEACH, Radiation Bio-Effects
Program, National Center for Radia-
tion Health, 12720 Twinbrook Park-
way, Rockville, Md. 20852
HAROLD H. K. LEE, Dept. of Biology,
University of Toledo, Toledo, Ohio
43606
PHILIP C. LEE, JR., Route 2, Box 127,
Troutville, Va. 24175
WALTER H. LEIGH, Dept. of Zoology,
University of Miami, Coral Gables,
Fla. 33146
ROBERT S. LEISNER, AIBS, 3900 Wiscon-
sin Ave., N.W., Washington, D. C.
20016
MICHEL G. LELONG, Dept. of Biology,
University of South Alabama, Mobile,
Ala. 36608
WILLIAM C. LE NOIR, Dept. of Biology,
Columbus College, Columbus, Ga.
31907
RICHARD C. LEONARD, Botany Depart-
ment, University of N. C., Chapel
Hill, N. C. 27514
W. RAY LEONARD, Department of Bi-
ology, Wofford College, Spartanburg,
S. C. 29301
JOE ANN LEVER, 613 Poplar St.,

Spartanburg, So. Carolina 29302

- HELMUT LIETH, Department of Botany,
University of North Carolina, Chapel
Hill, N. C. 27514
JAMES N. LILES, Dept. of Zoology and
Entomology, University of Tennessee,
Knoxville, Tenn. 37916
GARRETT W. LINK, JR., 1591 S. Sycam-
ore St., Petersburg, Va. 23803
THOMAS LaRUE LINTON, University of
Georgia, Marine Institute, Sapelo
Island, Georgia 31327
LEWIS LIPPS, Dept. of Biology, Shorter
College, Rome, Ga. 30161
JOHN F. LOCKE, SR., P. O. Box 1568,
State College, Miss. 39762
ROBERT W. LONG, Department of
Botany, University of South Florida,
Tampa, Fla. 33620
WILLIAM D. LONGEST, 1582 Buchanan,
Oxford, Miss. 38655
LOIS P. LORD, Dept. of Biology, Lam-
buth College, Jackson, Tenn. 38301
ROBERTA LOVELACE, Dept. of Biology,
University of South Carolina, Colum-
bia, S. C. 29208
GEORGE H. LOWERY, JR., Museum of
Zoology, Louisiana State University,
Baton Rouge, La. 70803
BERNARD LOWY, Mycological Herbarium,
Louisiana State University, Baton
Rouge, La. 70803
TERRY W. LUCANSKY, 3600 Tremont
Drive, Apt. H-3, Durham, N. C. 27705
C. J. LUDLOW, c/o Francis Booe, R. R.
#1, Veedsburg, Ind. 47987
ROGER H. LUMB, Dept. of Biology,
Western Carolina College, Cullowhee,
N. C. 28723
LEONARD E. LUNDQUIST, Depart-
ment of Biology, University of South
Carolina, Columbia, S. C. 29208
TALMAGE E. LUNDY, Department of Bi-
ology, East Carolina University, Green-
ville, N. C. 27834
G. ROBERT LUNZ, JR., Bears Bluff
Laboratories, Wadmalaw Island, S. C.
29487
PAUL E. LUTZ, Dept. of Biology, Univer-
sity of N. C. at Greensboro, Greens-
boro, N. C. 27412
JOHN ROBERT LYMANGROVER, Dept.
of Zoology, University of Kentucky,
Lexington, Ky. 40506
ROBERT T. LYNN, 925 Krest Dr.,
Weatherford, Oklahoma 73096
JAMES B. LYTLE, Biology Department,
Columbus College, Columbus, Ga.
31907

M

- MARY S. MacDOUGALL, 423 Clairmont
Ave., Apt. 3, Decatur, Ga. 30030
JOHN P. MacNAMARA, Department
of Biology, Spring Hill College,
Mobile, Ala. 36608
H. MacVANDIVIERE, College of Medi-
cine, Dept. of Community Med., Uni-
versity of Kentucky, Lexington, Ky.
40506
VON H. McCASKILL, Apt. B, 22 Barre
St., Clemson, S. C. 29631
ROBERT W. McCAULEY, 118 Forest Hill
Dr., Kitchener, Ontario, Canada
BOBBY JOE McCLENDON, Fort Valley
High School, Fort Valley, Ga. 31030
WILMA KIRKPATRICH McClURE, Rose-
crest Road, R. F. D. 6, Spartanburg,
S. C. 29301
IOLA T. McClURKIN, Department of
Biology, University of Mississippi,
University, Miss. 38677
J. FRANK McCORMICK, Dept. of Botany,
University of North Carolina, Chapel
Hill, No. Car. 27514
BRENDA FAYE McCOY, Box 2594,
Cullowhee, N. C. 28723
EDWARD McCRADY, III, Univ. of N. C.
at Greensboro, Greensboro, N. C.
27412
ANNE B. McCRARY, 411 Summer Rest
Road, Wilmington, No. Carolina
28401
JOHN D. McCRONE, Dept. of Zoology,
University of Florida, Gainesville, Fla.
32601
HERBERT A. McCULLOUGH, Dept. of
Biology, Samford Univ., Birmingham,
Ala. 35209
JAMES S. McDANIEL, Department of
Biology, East Carolina University,
Greenville, N. C. 27834
JAMES C. McDONALD, Box 7325, Wake
Forest College, Winston-Salem, N.
Car. 27106
SAM E. McFADDEN, Dept. of Orna-
mental Horticulture, University of
Florida, Gainesville, Fla. 32601
WALTER D. McGAVOCK, 2816 W. Wal-
nut St., Johnson City, Tenn. 37601
JOHN T. McGINNIS, Computer Center,
Univ. of Georgia, Athens, Ga. 30601
JAMES W. McINTOSH, Dept. of Biology,
Patrick Henry College, Martinsville,
Va. 24112
ROBERT A. McINTYRE, JR., Dept. of
Biology, Campbell College, Buies
Creek, N. C. 27506

- ELLEN W. McLAUGHLIN, Dept. of Biology, Samford University, Birmingham, Ala. 35209
- REBECCA L. McNEILL, Department of Biology, Georgia Southwestern College, Americus, Ga. 31709
- ILDA McVEIGH, Box 1549 Sub Station B, Vanderbilt University, Nashville, Tenn. 37203
- TE-HAIU MA, Radiation Biology Laboratory, Smithsonian Institution, Washington, D. C. 20560
- J. J. MADDOX, Department of Biological Sciences, Miss. State College for Women, Columbus, Miss. 39701
- GRACE C. MADSEN, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- JAMES MAFFETT, Manatee Jr. College, Bradenton, Fla. 33505
- JOHN G. MAHAN, Lynchburg College, Lynchburg, Va. 24504
- JOSEPH J. MAHONEY, JR., Department of Zoology, University of Georgia, Athens, Ga. 30601
- WALTER WM. MANIGAULT, P. O. Box 771, Georgetown, S. C. 29440
- W. D. MANKIN, Box 472, Herndon, Va. 22070
- LILLIAN C. MANLEY, Judson College, Marion, Ala. 36756
- JETHRO O. MANLY, Division of Natural Sciences, Pfeiffer College, Misenheimer, N. C. 28109
- RAYMOND B. MANNING, Division of Crustacea, Smithsonian Institution, United States National Museum, Washington, D. C. 20560
- WM. P. MAPLES, Dept. of Zoology, University of Georgia, Athens, Ga. 30601
- FREDERICK C. MARLAND, Univ. of Georgia Marine Institute, Sapelo Island, Ga. 31327
- GUY D. MARLOW, 264 Garden Road, New Orleans, La. 70123
- SAMUEL P. MARONEY, Dept. of Biology, Gilmer Hall, University of Virginia, Charlottesville, Va. 22903
- G. ALEX MARSH, Box 37, Gloucester Point, Va. 23062
- JACK S. MARSHALL, Savannah R. Laboratory, Aiken, S. C. 29801
- DANIEL E. MARVIN, 46 Arnold Ave., Radford, Va. 24141
- ROBERT H. MARTIN, Martin Instrument Co., Box 688, Greenville, So. Car. 29602
- U. LORELLE F. MARTIN, Route 4, Mount Olive, N. C. 28365
- VIRGINIA L. MARTIN, Dept. of Biology, Queens College, Charlotte, N. C. 28207
- HENRY M. MATHEWS, Dept. of Biology, Emory University, Atlanta, Ga. 30322
- MISS HAZEL MATTHEWS, 1403 Wellons Avenue, Dunn, N. C. 28334
- JAMES F. MATTHEWS, Dept. of Biology, Univ. of N. C. at Charlotte, Charlotte, N. C. 28205
- FRANK J. S. MATURO, JR., Dept. of Zoology, University of Florida, Gainesville, Fla. 32601
- DR. KISHWAR MIRZA MAUR, Division of Biological Sciences, Georgia Southern College, Statesboro, Ga. 30458
- JOHN S. MĒCHAM, Dept. of Biology, Texas Technological Coll., Lubbock, Texas 79409
- DENNIS WAYNE MEDFORD, Department of Biology, Memphis State University, Memphis, Tenn. 38111
- WILLIAM L. MENGBIER, 211 Dixie Avenue, Harrisonburg, Va. 22801
- EDWARD F. MENHINICK, Dept. of Biology, University of North Carolina, Charlotte, N. Car. 28208
- MARGARET Y. MENZEL, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- R. W. MENZEL, Dept. of Oceanography, Florida State University, Tallahassee, Fla. 32306
- JOHN V. MERRINER, P. O. Box 5577, College Station, Raleigh, N. C. 27607
- MAURICE F. METTEE, JR., Department of Biology, University of Alabama, Tuscaloosa, Ala. 35401
- ERIC C. MEYER, Department of Botany, University of Georgia, Athens, Ga. 30601
- SAMUEL L. MEYER, Ohio Northern University, Ada, Ohio 45810
- BURLYN E. MICHEL, Dept. of Botany, University of Georgia, Athens, Ga. 30601
- WILLIAM R. MILLARD, 206 Bowler Ave., Bay Minette, Ala. 36507
- CHARLES E. MILLER, Dept. of Botany, Ohio University, Athens, Ohio 45701
- FAITH S. MILLER, Dept. of Anatomy, Tulane University School of Medicine, 1430 Tulane Ave., New Orleans, La. 70112
- GROVER C. MILLER, Dept. of Zoology, Box 5215 College Station, North Carolina State College, Raleigh, N. C. 27607
- ISAAC H. MILLER, JR., Dept. of Biochemistry, Meharry Medical College, Nashville, Tenn. 37208
- JAMES A. MILLER, JR., Dept. of Anatomy, Tulane University School of Medicine, 1430 Tulane Ave., New Orleans, La. 70112
- MARGARET WALDREP MILLER, Dept. of Biology, University of South Alabama, Mobile, Ala. 36608
- ROBERT J. MILLER, Radford College, Radford, Va. 24141
- WILLIAM W. MILLER, III, Dept. of Biology, Northeast Louisiana State College, Monroe, Louisiana 71201
- HONG S. MIN, Dept. of Biology, Ga. Inst. of Technology, Atlanta, Ga. 30332
- NORMAN MITLIN, Box 5367, U. S. Dept. of Agriculture, State College, Miss. 39762
- EDWARD J. MITZEN, 7535 B Pell Street, Columbia, S. C. 29209
- CARL D. MONK, Botany Department, University of Georgia, Athens, Ga. 30601
- FLORENCE I. MONTGOMERY, Department of Botany, University of Georgia, Athens, Ga. 30601
- GEORGE MONTGOMERY, Department of Biology, Northeast La. State College, Monroe, La. 71201
- JOSEPH G. MONTGOMERY, Dept. of Biology, Manatee Junior College, Bradenton, Fla. 33505
- ETHEL C. MONTIEGEL, Dept. of Biology, West Virginia University, Morgantown, West Va. 26505
- CLIFTON H. MOORE, Department of Biology, Voorhees College, Denmark, S. C. 29042
- DAVID J. MOORE, Box 669, Radford College, Radford, Va. 24141
- JACK H. MOORE, Dept. of Botany & Plant Pathology, Auburn University, Auburn, Ala. 36830
- ROYALL T. MOORE, Dept. of Botany, N. C. State Univ., Raleigh, N. C. 27607
- DAVID M. MORRIS, Biology Department, Augusta College, Augusta, Ga. 30904
- ELLA D. MORRIS, Spring Hill College, Spring Hill Station, Mobile, Ala. 36608
- W. H. MORRIS, JR., 914 Carolina Avenue, North Augusta, S. C. 29841
- RALPH M. MORRISON, Dept. of Biology,

Woman's College of North Carolina,
Greensboro, N. C. 27412

ROBERT H. MOUNT, Dept. of Zoology-
Entomology, Auburn University, Au-
burn, Ala. 36830

SAMUEL C. MOZLEY, Box 593, Jones-
boro, Ga. 30233

SABINA MUELLER, Shippensburg State
College, Science Dept., Shippensburg,
Pa. 17257

MOHAMMED S. MULKANA, Dept. of
Zoology, Gulf Coast Research Lab.,
Ocean Springs, Miss. 39564

J. H. MULLAHY, Dept. of Biology, Loyola
University, New Orleans, La. 70118

NORA E. MULLENS, 230 W. Mt. View
Ave., Greenville, So. Carolina 29609

JOHN T. MULLINS, Dept. of Botany,
University of Florida, Gainesville, Fla.
32601

WILLIAM H. MURDY, Dept. of Biology,
Emory University, Atlanta, Ga. 30322

GLENN W. MURPHY, 901 W. Franklin
St., Richmond, Virginia 23220

J. J. MURRAY, Dept. of Biology, Uni-
versity of Virginia, Charlottesville,
Virginia 22903

JAMES T. MURRELL, JR., Department of
General Biology, Vanderbilt Univer-
sity, Nashville, Tenn. 37203

MARION R. MYLES, Route 3, Box 454 A,
Jackson, Miss. 39213

N

JAMES L. NATION, Dept. of Zoology,
University of Florida, Gainesville, Fla.
32601

AUBREY W. NAYLOR, Dept. of Botany,
Duke University, Durham, No. Caro-
lina 27706

FELTON R. NEASE, 1010 Rosehill, Dur-
ham, N. C. 27705

STUART E. NEFF, Dept. of Biology,
Virginia Polytechnic Institute, Blacks-
burg, Va. 24060

RICHARD H. NEILL, Department of Gen-
eral Biology, Vanderbilt University,
Nashville, Tenn. 37203

E. LEE NELSON, Florida Junior College,
Jacksonville, Fla. 32205

GIDEON E. NELSON, JR., Dept. of Bi-
ology, University of South Florida,
Tampa, Fla. 33620

RIVERS Y. NESOM, Box 219, Dept.
of Biological Sciences, Southeastern
Louisiana College, Hammond, La.
70401

SANDY NEWMAN, 216 Lonesome Road,
Madison, N. C. 27025

JANE E. NICHOLSON, F-109 Coopers-
town, Lexington, Ky. 40506

HERMAN R. NIXON, 1317 Feenwood
Drive, Jackson, Miss. 39213

GLENN R. NOGGLE, Dept. of Botany,
North Carolina State College, Raleigh,
N. C. 27607

DARWIN E. NORBY, RFD 2, Box 51,
Enumclaw, Washington 98022

FRED H. NORRIS, Dept. of Botany,
University of Tennessee, Knoxville,
Tenn. 37916

W. W. NORRIS, JR., Biology Dept.,
N. E. Louisiana State College, Monroe,
La. 71201

DAVID A. NUNNALLY, Box #1812,
Vanderbilt University, Nashville, Tenn.
37203

J. W. NUTTYCOMBE, Dept. of Zoology,
University of Georgia, Athens, Ga.
30601

THOMAS G. NYE, Department of Biolo-
gy, Washington & Lee University,
Lexington, Va. 24450

O

AARON H. O'BIER, Biology Dept., New-
berry College, Newberry, S. C. 29108

J. ELBERT O'CONNELL, 4200 Cathedral
Ave., NW, Washington, D. C. 20016

JAMES L. O'CONNER, Dept. of Botany,
University of Georgia, Athens, Ga.
30601

THEODORE T. O'DELL, Biology Division,
Oak Ridge National Laboratory, Oak
Ridge, Tenn. 37830

EUGENE P. ODUM, Dept. of Zoology,
University of Georgia, Athens, Ga.
30601

JOSEPH C. O'KELLEY, P. O. Box 1927,
University of Alabama, University,
Ala. 35486

DONALD A. OLEWINE, Department of
Biology, Georgia Southern College,
Statesboro, Ga. 30458

PAUL D. OLEXIA, Botany Department,
University of Tennessee, Knoxville,
Tenn. 37916

H. J. OOSTING, Dept. of Botany, Duke
University, Durham, N. Car. 27706

PAUL J. OSBORNE, Dept. of Biology,
Lynchburg College, Lynchburg, Va.
24504

THOMAS S. OSBORNE, 1299 Bethel
Valley Road, Oak Ridge, Tenn. 37830

KENNETH OTTIS, Dept. of Zoology and
Entomology, Auburn University, Au-
burn, Ala. 36830

RODERICK H. OUTLAND, Box 3986,
Northwestern State College, Natchi-
toches, La. 71457

L. M. OUTTEN, Dept. of Biology, Mars
Hill College, Mars Hill, N. C. 28754

BILL OVERTON, 135 College Ave.,
Danville, Va. 24541

H. MALCOLM OWEN, Dept. of Biology,
The University of the South, Sewanee,
Tenn. 37375

ELIZABETH S. OWINGS, Dept. of Biolo-
gy, East Tennessee State University,
Johnson City, Tenn. 37601

P

JAMES FELIX PALMER, Box 1927, De-
partment of Biology, University of
Alabama, University, Ala. 35486

L. GERALD PARCHMAN, Dept. of Biolo-
gy, University of Delaware, Newark,
Del. 19711

JOHN GERALD PARCHMENT, Box 477,
Mid. Tenn. State University, Mur-
freesboro, Tenn. 37130

E. S. PARKER, Department of Botany,
Georgia Southern College, Statesboro,
Ga. 30458

JAMES C. PARKER, 806 S. Main St.,
Apt. 1, Blacksburg, Virginia 24060

GRADY PARKS, 1841 Skyland Terrace,
Atlanta, Ga. 30319

JAMES C. PARKS, Department of Gen-
eral Biology, Vanderbilt University,
Nashville, Tenn. 37203

JAMES F. PARNELL, Biology Dept., Wil-
mington College, Wilmington, No.
Carolina 28401

DAVID V. PARRISH, Department of Bi-
ology, Wake Forest University, Wins-
ton-Salem, N. C. 27106

FRED K. PARRISH, Dept. of Biology, Ga.
State College, 33 Gilmer St., S.E.,
Atlanta, Ga. 30303

JOANNA W. PARRISH, Rt. 2, Box 183,
Conyers, Ga. 30207

ANNE L. PATES, Dept. of Biological
Science, Florida State University,
Tallahassee, Fla. 32306

ANN P. PATTERSON, Parker's Mill Road,
Lexington, Ky. 40504

JOHN A. PATTERSON, Dept. of Biology,
Middle Tennessee State College, Mur-
freesboro, Tenn. 37130

- ROSALYN M. PATTERSON, 401 Wilson Mill Rd., S.W., Atlanta, Ga. 30331
- ERNEST G. PATTON, Dept. of Biology, Wofford College, Spartanburg, S. C. 29301
- DENISE I. PAV, East Tenn. State Univ., Johnson City, Tenn. 37601
- JOHN H. PAXTON, Department of Zoology, University of Georgia, Athens, Ga. 30601
- MAYME N. PAYNE, 118-47 201 Street, St. Albans, N. Y. 11412
- MARGARET H. PEASLEE, Department of Biology, Florida Southern College, Lakeland, Fla. 33802
- ROBERT A. PEDIGO, Dept. of Biology, St. Andrews Presbyterian College, Laurinburg, N. C. 28352
- WILLIAM T. PENFOUND, Department of Biology, Warren Wilson College, Swannanoa, N. C. 28778
- MAGGIE PENNINGTON, Anatomy Department, College of Charleston, Charleston, S.C. 29401
- R. C. PENNINGTON, Anatomy Department, Medical College of S. C., Charleston, S. C. 29401
- TULLY S. PENNINGTON, Box 2074, Georgia Southern College, Statesboro, Georgia 30458
- FRANK O. PERKINS, Va. Institute of Marine Science, Gloucester Point, Va. 23062
- JAMES D. PERRY, Department of Biology, Asheville-Biltmore College, Asheville, N. C. 28801
- MRS. LINDA J. PERRY, Box 643, Western Carolina University, Cullowhee, N. C. 28723
- J. PETIT, Centre National de Documentation, Scientifique et Technique, 4, Boulevard de l'Empereur, Bruxelles 1, Belgium
- RUTH P. PHILLIPS, 490 Avalon Road, Winston-Salem, N. C. 27104
- MARTIN A. PIEHL, Dept. of Botany, University of Wisconsin, Milwaukee, Wis. 53201
- KENNETH M. PIEL, Dept. of Biology, University of British Columbia, Vancouver 8, Canada
- E. LOWE PIERCE, Dept. of Zoology, University of Florida, Gainesville, Fla. 32601
- JOHN D. PIKE, Department of Botany, University of Tennessee, Knoxville, Tenn. 37916
- ALLEN PINGEL, Apt. 3B Woodland Terrace, Columbia, S. C. 29205
- JACK D. PITTILLO, Box 1545, Cullowhee, N. C. 28723
- GERALD PITTS, Dept. of Biology, University of South Carolina, Columbia, S. C. 29208
- ROBERT B. PLATT, Dept. of Biology, Emory University, Atlanta, Ga. 30322
- GAYTHER L. PLUMMER, Dept. of Botany, University of Georgia, Athens, Ga. 30601
- CLYDE F. POLK, 207 Faculty Dr., Wingate, N. C. 28174
- STANLEY D. POOLE, 431 Wilson Hall, Dept. of Zoology, Univ. of N. C., Chapel Hill, N. C. 27514
- E. DWAIN PORTER, Dept. of Biology, W. Georgia College, Carrollton, Ga. 30117
- ISABEL POTTER, 1059 Ebenezer Ave. Ext., Rock Hill, S. C. 29730
- RICHARD H. POUGH, 33 Highbrook Ave., Pelham, N. Y. 10803
- VERNON N. POWDERS, Dept. of Biology, Georgia Southwestern College, Americus, Ga. 31709
- HARRY L. POWE, Dept. of Biology, East Tennessee State University, Johnson City, Tenn. 37601
- JEFFREY P. POWELL, 190 Daley Blvd., Rochester, N. Y. 14617
- ROBERT W. POWELL, JR., Dept. of Biology, Converse College, Spartanburg, S. C. 29301
- ROLAND HAYES POWELL, Dept. Biology, Jackson State College, Jackson, Miss. 39217
- PATRICIA ANN POWER, 10920 W. Golf Dr., Miami, Fla. 33167
- CHARLES E. PRICE, Augusta College, Augusta, Ga. 30904
- JAMES A. PRICE, JR., Dept. of Biological Sciences, Northwestern State College, Natchitoches, La. 71457
- THOMAS J. PRICE, Box 437, Beaufort, No. Carolina 28516
- ELMER C. PRICHARD, Dept. of Biology, Stetson University, Deland, Fla. 32720
- B. EARL PRINCE, Department of Biology, Northeast La. State College, Monroe, La. 71201
- RUDOLPH PRINS, Department of Biology, Western Kentucky University, Bowling Green, Ky. 42101
- NELL PRIOR, College of Charleston, 138 Broad Street, Charleston, S. C. 29401
- GEORGE PSHENAY, Dept. of Zoology, Univ. of Kentucky, Lexington, Ky. 40506
- JEAN PUGH, Dept. of Biology, Christopher Newport College, Newport News, Va. 23601
- THOMAS M. PULLEN, Dept. of Biology, University of Mississippi, University, Miss. 38677

Q

- ELSIE QUARTERMAN, Box 1616, Station B, Vanderbilt University, Nashville, Tenn. 37203
- THOMAS L. QUAY, Dept. of Zoology, North Carolina State University, Raleigh, N. Car. 27607
- W. H. Queen, 1617 Hollywood Dr., Columbia, S. C. 29205

R

- ALBERT E. RADFORD, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514
- HARVEY L. RAGSDALE, Department of Biology, Emory University, Atlanta, Ga. 30322
- ROBERT C. RAMGER, Department of Biology, Maryville College, Maryville, Tenn. 37801
- GEORGE S. RAMSEUR, Texas Avenue, Sewanee, Tenn. 37375
- GWYNN W. RAMSEY, Lynchburg College, Lynchburg, Va. 24504
- GAIL RANDALL, 2204 Roosevelt, Macon, Ga. 31204
- R. D. RAO, Dept. of Botany, P. O. Box 5186, North Carolina State University, Raleigh, N. C. 27607
- JACQUES RAPPAPORT, Dept. of Biology, University of Virginia, Charlottesville, Va. 22903
- KENNETH D. RATLIFF, P. O. Box 183, Irvington, Ky. 40146
- C. LYNN RAULERSON, Department of Zoology, University of Georgia, Athens, Ga. 30601
- JOHN M. RAWLS, Dept. of Biology, University of South Alabama, Mobile, Ala. 36608
- CHARLES RAY, JR., Dept. of Biology, Emory University, Atlanta, Ga. 30322
- JAMES D. RAY, JR., Dept. of Biological Sciences, University of South Florida, Tampa, Fla. 33620
- WILLIE M. REAMS, JR., Dept. of Biology,

- University of Richmond, Richmond, Va. 23173
- PAUL S. REDDISH, Dept. of Biology, P. O. Box 275, Elon College, Elon College, N. C. 27244
- CLYDE F. REED, 10105 Harford Road, Baltimore, Md. 21234
- CLYDE T. REED, 3202 N. Rome Ave., Tampa, Fla. 33607
- WILLIAM D. REESE, Dept. of Biology, Box 854, University of Southwestern Louisiana, Lafayette, La. 70501
- ROBERT J. REIBER, Georgia State College, 33 Gilmer St., S.E., Atlanta, Ga. 30303
- DAVID E. REICHLE, Dept. of Radiation Ecology, Oak Ridge Nat. Lab., Oak Ridge, Tenn. 37830
- GEORGE K. REID, Dept. of Biology, Florida Presbyterian College, St. Petersburg, Fla. 33711
- WILLIAM K. REISEN, P. O. Box 4495, Clemson University, Clemson, S. C. 29631
- DAVID H. REMBERT, JR., Dept. of Biology, University of South Carolina, Columbia, S. Car. 29208
- GEORGE JONES RENWICK, P. O. Box 525, Newberry, S. C. 29108
- JOHN D. REYNOLDS, Dept. of Biology, Richmond Professional Institute, 901 West Franklin, Richmond, Va. 23220
- J. PAUL REYNOLDS, Wilmington College, Wilmington, N. C. 28401
- PETER B. RHOADS, 5765 SW 56 Terr, Miami, Fla. 33143
- NOLAN E. RICE, Dept. of Biology, University of Richmond, Richmond, Va. 23173
- T. R. RICE, BCF-Radiobiological Lab., Beaufort, N. Car. 28516
- WALTER L. RICHARDS, JR., 1502 Cedar Lane, Richmond, Va. 23225
- ANNIE L. RICHARDSON, Johnson C. Smith University, Charlotte, N. C. 28208
- R. L. RICHARDSON, 7006 Highview Terrace, West Hyattsville, Md. 20782
- HERBERT P. RILEY, Visiting Professor, Dept. of Botany, Univ. of California, Irvine, Calif. 92664
- ROBERT A. RINALDI, Vanderbilt University, School of Medicine, Nashville, Tenn. 37203
- JAMES L. RIOPEL, Dept. of Biology, University of Virginia, Charlottesville, Va. 22903
- LARRY RISINGER, 1406 Chester St., Myrtle Beach, S. C. 29577
- ROBERT H. RIVERS, #3-215 Hayden Road, Tallahassee, Fla. 32304
- DONALD R. ROBERTS, U. S. Forest Service, P. O. Box 3, Olustee, Fla. 32072
- HENRY S. ROBERTS, Dept. of Biology, Washington & Lee University, Lexington, Virginia 24450
- JOHN F. ROBERTS, Dept. of Zoology, N. Car. State University, Raleigh, N. Car. 27607
- PATRICIA A. ROBERTS, Department of General Biology, Vanderbilt University, Nashville, Tenn. 37203
- CLYDE H. ROBERTSON, JR., Dept. of Biology, Pfeiffer College, Misenheimer, N. C. 28109
- EDWARD S. ROBINSON, University Of New South Wales, Sidney, Australia
- CHAS. LELAND RODGERS, Furman University, Greenville, S. C. 29613
- MARTIN ROEDER, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- DAVID T. RODGERS, JR., Box 1927, University, Ala. 35486
- HOLLIS J. ROGERS, Dept. of Biology, Woman's College of North Carolina, Greensboro, N. C. 27412
- SHARRON ELIZABETH ROGERS, 420 E. Radiance Dr., Greensboro, N. C. 27403
- STEFFEN H. ROGERS, Dept. of Pathobiology, John Hopkins University, Baltimore, Md. 21218
- COLLEEN L. ROSE, 4205 Oak Ridge Drive, Charleston Heights, S. C. 29405
- CURT D. ROSE, Dept. Biological Sciences, Nicholls State College, Thibodaux, La. 70301
- JAMES B. ROSS, Reinhold Book Corp., 430 Park Avenue, New York, N. Y. 10022
- DAVID T. ROVEE, R. D. 1, Hopewell Woodside Road, Hopewell, N. J. 08525
- JANE T. ROWLAND, 1339 Winter St., Augusta, Ga. 30904
- ISABEL I. ROYER, Western Maryland College, Westminster, Maryland 21157
- ELLIS S. RUCKER, Dept. of Biology, Middle Tennessee State College, Murfreesboro, Tenn. 37130
- GERALD RUNEY, Biology Department, The Citadel, Charleston, S. C. 29409
- BENJAMIN F. D. RUNK, Dept. of Biology, University of Virginia, Charlottesville, Va. 22903
- EARLENE A. RUPERT, Browns, Alabama 36724
- PRISCILLA S. RUSHTON, Dept. of Biology, Memphis State Univ., Memphis, Tenn. 38111
- WILLIAM F. RUSKA, JR., 3242 Downing Drive, Lynchburg, Va. 24503
- EDWARD P. RYAN, Dept. of Biology, East Carolina College, Greenville, N. Car. 27834

S

- PAUL SACCO, 8 Curry Court, Metairie, La. 70003
- CLARANCE R. SADLER, Box 357, Central Lab., Forest, Miss. 39074
- ARMSTEAD L. SALTERS, 429 Bowen Circle,, Apt. 2, Atlanta, Ga. 30315
- C. R. SANDBERG, 5918 Clinton Hwy., Knoxville, Tenn. 39712
- BEN W. SANDERS, Box 422, Dahlonega, Ga. 30533
- WILLIAM A. SANDERS, 309 South Carroll Street, Alburn, Ga. 30203
- MILDRED L. SARKS, George Washington College Biology Dept., 4400 University Drive, Fairfax, Va. 22030
- PATRICIA A. SARVELLA, Poultry Research Branch, Agricultural Research Ser., Agricultural Research Center, Beltsville, Md.. 20705
- JAMES D. SATTERFIELD, Biology Dept., Georgia State College, 33 Gilmer St., Atlanta, Georgia 30303
- E. G. FRANZ SAUER, Dept. of Biology, University of Florida, Gainesville, Fla. 32601
- GEORGE P. SAWYER, JR., Biology Dept., Coker College, Hartsville, S. C. 29550
- FRANCES PENNELL SCARBORO, 225 Greer Drive, Brunswick, Ga. 31520
- BARRY E. SCHAEFFER, 280 Ocean Parkway, Brooklyn, N. Y. 11218
- G. C. SCHAEFER, Department of Biology, University of Richmond, Richmond, Va. 23173
- CLAIRE L. SCHELSKE, Dept. of Environmental Health University of Michigan, Ann Arbor, Mich. 48104
- DAVID M. SCHIFF, Macon Jr. College, Macon, Ga. 31206
- STEFAN O. SCHIFF, Dept. of Zoology, George Washington University, Washington, D. C. 20006

- LUCILLE A. SCHMIEDER, Dept. of Biology, Ithaca College, Ithaca, N. Y. 14850
- ALBERT C. SCHWARTZ, 238 S. Marion, Columbia, S. C. 29205
- OTTO J. SCHWARZ, Department of Botany, North Carolina State University, Raleigh, N. C. 27607
- A. FLOYD SCOTT, Department of Biological Sciences, University of South Alabama, Mobile, Ala. 36608
- DAVID L. SCOTT, Department of Biological Sciences, University of South Alabama, Mobile, Ala. 36608
- DONALD C. SCOTT, Beech Creek Rd., Athens, Ga. 30601
- WILLIAM W. SCOTT, Dept. of Botany, Eastern Illinois University, Charleston, Ill. 61920
- AARON SEAMSTER, Assistant Provost, Memphis State University, Memphis, Tenn. 38111
- ROBERT L. SEARLS, Dept. of Biology, University of Virginia, Charlottesville, Va. 22903
- SHUK DEB SEN, 672 Beckwith St., SW, Apt. 4, Atlanta, Ga. 30314
- ERNEST D. SENECA, Department of Botany, Box 5186, North Carolina State University, Raleigh, N. C. 27607
- H. E. SHADOWEN, 627 Cedar Ridge Road, Bowling Green, Kentucky 42101
- FRED SHANHOLTZER, Department of Zoology, University of Georgia, Athens, Ga. 30601
- W. ALLEN SHANNON, JR., Department of General Biology, Vanderbilt University, Nashville, Tenn. 37203
- LELAND SHANOR, Dept. of Botany, Univ. of Florida, Gainesville, Fla. 32601
- REBECCA RAYBURN SHARITZ, Coker Hall, University of North Carolina, Chapel Hill, N. C., 27514
- AARON J. SHARP, Dept. of Botany, University of Tennessee, Knoxville, Tenn. 37916
- HOMER F. SHARP, JR., 5134 Odum St., Covington, Ga. 30209
- J. M. SHARPLEY, Sharpley Laboratories, Inc., Box 846, Fredericksburg, Va. 22401
- WILLIAM N. SHAW, Bureau of Comm. Fisheries, Biological Laboratory, Oxford, Maryland 21654
- HARRY E. SHEALY, JR., Apt. 8-C Woodland Terrace, Columbia, S. C. 29205
- ROBERT MACK SHEALY, Dept. of Int. & Zoology, Clemson University, Clemson, S. C. 29631
- ROBERT A. SHELDON, Department of Zoology, University of Georgia, Athens, Ga. 30601
- LEWIS S. SHELTON, JR., 1036 Oxford Road, N.E., Atlanta, Ga. 30306
- H. B. SHERMAN, 410 W. Howry Ave., Deland, Fla. 32720
- STANWYN G. SHELTER, Dept. of Botany, U. S. National Museum, Washington, D. C. 20560
- A. RANDOLPH SHIELDS, Dept. of Biology, Maryville College, Maryville, Tenn. 37801
- BARBARA G. SHIPES, The Lyons, Apartment 205, Athens, Ga. 30601
- AZIZ SHIRALIPOUR, Box 12057 University Station, Gainesville, Fla. 32601
- ROBERT B. SHORT, Dept. of Biological Sciences, Florida State University, Tallahassee, Fla. 32306
- CHARLES S. SHOUP, 80 Outer Drive, Oak Ridge, Tenn. 37830
- JAMES B. SICKEL, P. O. Box 23206, Emory University, Atlanta, Ga. 30322
- FRANCES E. SILLIMAN, Bridgewater College, Bridgewater, Va. 22812
- MRS. MARVIN SILVER, 301 Grace Street, Harrisonburg, Va. 22801
- BILL A. SIMCO, Department of Biology, Memphis State University, Memphis, Tenn. 38111
- GEORGE M. SIMMONS, JR., Dept. of Biology Va. Commonwealth Univ., 901 W. Franklin St., Richmond, Va. 23220
- PAUL R. SIMONTON, Biology Dept., Memphis State University, Memphis, Tenn. 38111
- ASA C. SIMS, JR., Department of Biology, Box 9707 — Southern University, Baton Rouge, La. 70813
- E. T. SIMS, JR., Department of Horticulture, Clemson University, Clemson, S. C. 29631
- CHARLES A. SINGHAS, 10220 Pohick Rd., Fairfax, Va. 22039
- HARPAL SINGH, P. O. Box 8328, University of Tennessee, Knoxville, Tenn. 37916
- W. RALPH SINGLETON, 1841 University Circle, Charlottesville, Va. 22903
- MORGAN EMERY SISK, Route 3, Murray, Ky. 42071
- FRANK P. SIVIK, 1115 North 13 Terrace, Hollywood-by-the-Sea, Florida 33020
- JAMES N. SKEEN, Botany Department, University of Georgia, Athens, Ga. 30601
- BEN L. SLOAN, Dept. of Biology, Carson Newman College, Jefferson City, Tenn. 37760
- BARBARA SMALL, 1303 S. Washington St., Quitman, Ga. 31643
- ROBERT F. SMART, Dean's Office, University of Richmond, Richmond, Va. 23173
- ARLO I. SMITH, Southwestern at Memphis, Memphis, Tenn. 38112
- BARNETT F. SMITH, Dept. of Biology, Spelman College, Atlanta, Ga. 30314
- BEN W. SMITH, Dept. Genetics, North Carolina State Univ., Raleigh, N. Car. 27607
- BYRON C. SMITH, Dept. of Biology, University of Southern Mississippi, Hattiesburg, Miss. 39401
- GARY C. SMITH, Department of Zoology, University of Georgia, Athens, Ga. 30601
- KENNETH L. SMITH, JR., Department of Zoology, University of Georgia, Athens, Ga. 30601
- MICHAEL H. SMITH, U.S.A.E.C. — Savannah R. Ecd. Lab, SROO, Bldg., 772-G, Box A, Aiken, S. Car. 29801
- SEPTIMA C. SMITH, Box 1386, University, Ala. 35486
- WEBSTER ZEELAND SMITH, P. O. Box 125, Prince Frederick, Md. 20678
- JERRY SMOSKY, 8A Woodland Terrace, Columbia, S. C. 29205
- ELIZABETH C. SMOTHERS, 3501 Illinois Avenue, Apt. B16, Louisville, Ky. 40213
- JAMES L. SMOTHERS, Dept. of Biology, University of Louisville, Louisville, Kentucky 40208
- VIRGIL PAUL SNOW, JR., Dept. of Biology, West Georgia College, Carrollton, Ga. 30117
- EARL B. SNYDER, JR., Department of Zoology, University of Georgia, Athens, Ga. 30601
- FRANKLIN SOGANDARES, Dept. of Zoology, Tulane University, New Orleans, La. 70118
- JOHN M. SPEAR, P. O. Box 66, Misenheimer, N. C. 28109

- LORRAINE B. SPENCER, 104 Batchelor Dr., Greensboro, N. C. 27410
- ALDA M. SUIETH, Box #22, Livingston, Ala. 35470
- ELIZABETH F. SPRAGUE, Sweet Briar College, Sweet Briar, Va. 24595
- GEORGE SPRUGEL, JR., South First St., Rd., Champaign, Ill. 61820
- J. RICHARD STALLARD, Box 22920, Emory University, Atlanta, Ga. 30322
- WILBROD ST. AMAND, JR., Dept. of Biology, University of Mississippi, University, Miss. 38677
- GEORGIA S. ST. AMAND, Dept. of Biology, University of Mississippi, University, Miss. 38677
- RICHARD STALTER, High Point College, High Point, N. C. 27262
- WILLIAM F. STANDAERT, Dept. of Zoology, N. C. State Univ., Raleigh, N. Car. 27607
- JAMES H. STARLING, 207 Paxton Road, Lexington, Va. 24450
- ORRIE O. STENROOS, Division of Radiobiology, Medical College of Georgia, Augusta, Ga. 30902
- DANIEL H. STERN, Dept. of Biology, L.S.U.N.O., Lake Front, New Orleans, La. 70122
- MICHELE S. STERN, Department of Biology, Tulane University, New Orleans, La. 70118
- BOBBIE JEANETTE STEWART, Box 409, Va. Int. College, Bristol, Va. 24201
- SHELTON E. STEWART, Lander College, Greenwood, S. Car. 29646
- LUCILLE F. STICKEL, Patuxent Wildlife Res. Center, Laurel, Maryland 20810
- JAMES D. STIDHAM, Dept. of Biology, Presbyterian College, Clinton, S. C. 29325
- ROBERT A. STILES, Dept. of Zoology & Entomology, University of Tennessee, Knoxville, Tenn. 37916
- HARVEY L. STIREWALT, Dept. of Biology, Augusta College,, Augusta, Ga. 30904
- ALAN E. STIVEN, Dept. of Zoology, University of North Carolina, Chapel Hill, No. Car. 27514
- BETTYE R. STOKES, Box 131, Atlanta University, 223 Chestnut Street, SW, Atlanta, Ga. 30314
- DONALD E. STONE, Dept. of Botany, Duke University, Durham, N. C. 27706
- BENJAMIN P. STONE, University of Tennessee, Dept. of Botany, Knoxville, Tenn. 37916
- STEPHEN STORM, c/o Mrs. James A. Dodd, 43 Meadow Road, Riverside, Conn. 06878
- JOHN C. STRICKLAND, JR., Dept. of Biology, University of Richmond, Richmond, Va. 23173
- EUGENE F. STROBEL, 4338 Emory Avenue, Baton Rouge, La. 70808
- TIMOTHY SCOTT STUART, Dept. of Biology, Gaston College, Gastonia, N. C. 28052
- ALEX B. STUMP, Dept. of Biology, Presbyterian College, Clinton, S. C. 29325
- HARWELL P. STURDIVANT, Dept. of Biology, Western Maryland College, Westminster, Maryland 21157
- CLARENCE E. STYRON, 300 W. Vanderbilt Drive, Oak Ridge, Tenn. 37830
- ROBERT L. SULLIVAN, Box 7325 Reynolda Station, Winston-Salem, No. Car. 27106
- DAVID L. SUTTON, Dept. (Plant Pathol. & Physiol.), Virginia Polytechnic Institute, Blacksburg, Va. 24061
- LAWRENCE F. SWAILS, JR., Dept. of Biology, University of South Carolina, Florence, S. C. 29501
- JOYCE W. SWANBERG, Botany Department, Biological Sciences Building, University of Georgia, Athens, Ga. 30601
- LOUIS C. TEMPLE, Box 31, Clinton, Miss. 39056
- KENNETH R. TENORE, Department of Zoology, North Carolina State University, Raleigh, N. C. 27607
- CLAUDE E. TERRY, 1317 University Ave., Atlanta, Ga. 30310
- DEMPSEY L. THOMAS, Dept. of Biology — L.S.U. in New Orleans, Lakefront, New Orleans, La. 70122
- GRACE J. THOMAS, Dept. of Zoology, University of Georgia, Athens, Ga. 30601
- J. E. THOMAS, Department of Natural Sciences, South Carolina State College, Orangeburg, S. C. 29115
- JERRY P. THOMAS, P. O. Box 1927, University, Ala. 35486
- R. DALE THOMAS, Dept. of Biology, Northeast La. State College, Monroe, La. 71201
- WILLIAM A. THOMAS, JR., Building 2001, ORNL, Oak Ridge, Tenn. 37830
- E. F. THOMPSON, Department of Biology, University of South Carolina, Columbia, S. C. 29208
- MORROW B. THOMPSON, Van Wyck, S. C. 29744
- J. RICHARD THOMSON, National Academy of Sciences, 2101 Constitution Avenue, Washington, D. C. 20418
- SANDRA E. THRASH, 48 Ware St., Hogansville, Ga. 30230
- WILLIAM L. TIETJEN, Biology Dept., Georgia Southwestern Coll., Americus, Ga. 31709
- MRS. OLIE B. TILLERY, JR., 333 Park Ave., Bluff Park, Birmingham, Ala. 35226
- CECIL R. TILLIS, 844 Jog Road, West Palm Beach, Fla. 33406
- SAMUEL R. TIPTON, Dept. of Zoology and Entomology, University of Tennessee, Knoxville, Tenn. 37916
- SUE A. TOLIN, Dept. of Plant Pathology & Physiol., Virginia Polytechnic Institute, Blacksburg, Va. 24061
- JOANNE C. TONTZ, Dept. of Botany, University of Texas, Austin, Texas 78712
- MARY SUE TORRES, No. 266 Kapelsesteenweg, Brasschaat, Belgium
- H. R. TOTTEN, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514
- ROGER E. TOTTEN, Dept. of Bacteriology, University of Georgia, Athens, Ga. 30601

T

GEORGE F. TOWNES, Box 10128, Greenville, So. Car. 29603

ANN A. TOWNSEND, Botany Department, University of Georgia, Athens, Ga. 30601

J. I. TOWNSEND, Dept. of Biology and Genetics, Medical College of Virginia, Richmond, Va. 23219

SYBILE TRAMMELL, 25 Grier Apts., Gastonia, N. Car. 28052

ELIZABETH M. TRIPP, Rte. #4, Box #147, Piedmont, S. C. 29673

RICHARD P. TROGDON, North Georgia College, Dahlonega, Ga. 30533

EDITH E. TROTT, Department of Zoology, University of California, Los Angeles, Calif. 90024

LAMARR B. TROTT, Department of Zoology, University of California, Los Angeles, Calif. 90024

BARBARA TURNER, Rt. 4, Box 129, Edmondson Pike, Nashville, Tenn. 37211

HENRY F. TURNER, Dept. of Biology, Alabama College, Montevallo, Ala. 35115

MALCOLM E. TURNER, Dept. of Biometry, Emory University, Atlanta, Ga. 30322

TULLY H. TURNEY, Dept. of Biology, Hampden-Sydney College, Hampden-Sydney, Va. 23943

U

CLYDE J. UMPHLETT, Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514

JOHN E. UZODINMA, P. O. Box 7001, Jackson State College, Jackson, Miss. 39217

V

LAWRENCE R. VALCOVIC, Dept. of Genetics, N. C. State Univ., Raleigh, N. Car. 27607

WILLIAM B. VAN BUSKIRK, Box 220, Chester, S. C. 29706

D. S. VAN FLEET, Dept. of Botany, University of Georgia, Athens, Ga. 30601

ARNOLD F. VAN PELT, JR., Greensboro College, Greensboro, N. C. 27402

JOANN VAN SETERS, 6224 Wheeler Dr., Charlotte, N. C. 28211

BASUDEO VARMA, Dept. of Biology, Lynchburg College, Lynchburg, Va. 24504

I. K. VASIL, Department of Botany,

University of Florida, Gainesville, Fla. 32601

PAUL A. VESTAL, Dept. of Biology, Rollins College, Winter Park, Fla. 32789

ANN B. VINSON, 1361 Baez Street, Raleigh, N. C. 27608

JOHN WESLEY VOGHEY, Zoology Department, Univ. of South Fla., Bay Campus, St. Petersburg, Fla. 33701

C. A. VOIGT, 229 Chelsea Drive, Decatur, Ga. 30030

E. PETER VOLPE, Dept. of Zoology, Newcomb College of Tulane University, New Orleans, La. 70118

GENE VREDEVELD, University of Chattanooga, Chattanooga, Tenn. 37403

W

C. KENYON WAGNER, Savannah River Ecology Lab, USAEC, Box A, Aiken, S. C. 29801

DIANE T. WAGNER, Department of Biological Science, University of South Florida, Tampa, Fla. 33620

KENNETH A. WAGNER, Wesleyan College, Rocky Mount, N. Car. 27801

EWELL D. WAITS, 305 S. Burbank Drive, Birmingham, Ala. 35226

GRAY W. WALDORF, Pensacola Junior College, Pensacola, Fla. 32504

DIANA H. WALL, Botany Dept., University of Kentucky, Lexington, Ky. 40506

H. K. WALLACE, 920 S.W. 1st Ave., Gainesville, Florida 32601

ALMA T. WALKER, 1095 Ivywood Drive, Athens, Ga. 30601

SALLY WALKER, Apt. 2-F Bel-Wise Arms, 7321 Wise Ave., St. Louis, Mo. 63117

MRS. RUTH E. EARLE WALTON, 1727 Hunt Avenue, Richland, Wash. 99352

WESLEY WALRAVEN, Kennesaw Junior College, Marietta, Ga. 30060

LUCILLE WALTON, 1116 Richmond Blvd., Danville, Virginia, 24541

MARGARET WALTON, 1116 Richmond Blvd., Danville, Virginia 24541

HELEN L. WARD, Dept. of Zoology, University of Tennessee, Knoxville, Tenn. 37916

JAMES W. WARD, Department of Anatomy, Univ. of Mississippi Medical Center, Jackson, Miss. 39216

JOHN E. WARD, JR., 4304 Trenholm Road, Columbia, S. C. 29206

ROBERT P. WARD, P. O. Box #153,

George Peabody College, Nashville, Tenn. 37203

GEORGE H. WARE, Dept. of Biological Sciences, Northwestern State College, Natchitoches, La. 71457

STEWART A. WARE, Dept. of Biology, College of William & Mary, Williamsburg, Va. 23185

DAN H. WARMBROD, Hillcrest Farm, Belvidere, Tenn. 37306

C. O. WARREN, Biology Department, Southwestern at Memphis, Memphis, Tenn. 38112

MARY WARTERS, Dept. of Biology, Centenary College, Shreveport, La. 71104

EARL R. WASCOM, Corbin, Louisiana 70724

GEORGE C. WASHINGTON, Jackson State College, Jackson, Miss. 39217

MARVIN L. WASS, Virginia Institute of Marine SC., Gloucester Point, Va. 23062

WILLIE C. WATTS, 868 Fair St., SW, Atlanta, Ga. 30314

S. A. WAVE, Dept. of Biology, Vanderbilt University, Nashville, Tenn. 37203

SCOTT M. WEATHERSBY, Dept. of Zoology, Box 201, Louisiana Polytechnic Institute, Ruston, La. 71270

MACON M. WEAVER, 277 Gaddis, Jackson, Miss. 39204

WAYNE WEAVER, Botany Department, University of Tennessee, Knoxville, Tenn. 377916

KENNETH L. WEBB, Va. Institute of Marine Science, Gloucester Point, Va. 23062

LEO WEEKS, Dept. of Biology, High Point College, High Point, N. C. 27262

JOEL RICHARD HIRAM WEINER, Dept. of Biology, St. Mary's Jr. College, Raleigh, N. C. 27602

BRUCE L. WELCH, Memorial Research Center, University of Tennessee, Knoxville, Tenn. 37920

ANN MARIE WELCH, Memorial Research Center, University of Tenn., Knoxville, Tenn. 37920

ARTHUR L. WELDEN, Dept. of Biology, Tulane University, New Orleans, La. 70118

CAROLYN WELLS, Dept. of Biology, Longwood College, Farmville, Va. 23901

HARRY W. WELLS, Dept. of Biological Sciences, Univ. of Delaware, Newark, Delaware 19711

- JAMES R. WELLS, Dept. of Biology, Old Dominion College, Norfolk, Va. 23508
- MARION R. WELLS, Box 252, Middle Tennessee State University, Murfreesboro, Tenn. 37130
- JERRY WEST, Route 313, Box 26, Cullowhee, N. C. 28723
- W. R. WEST, JR., Box 248, Dept. of Biology, University of Richmond, Richmond, Virginia 23173
- JONATHAN J. WESTFALL, Dept. of Botany, University of Georgia, Athens, Ga. 30601
- MINTER J. WESTFALL, JR., Dept. of Biology, University of Florida, Gainesville, Fla. 32601
- RAYMOND NELSON WESTRA, Dept. of Biology, Georgia Southwestern College, Americus, Ga. 31709
- CHARLES H. WHARTON, Dept. of Biology, Georgia State College, Atlanta, Georgia 30303
- BOOKER T. WHATLEY, P. O. Box 9969, Dept. of Horticulture, Southern University, Baton Rouge, La. 70813
- HARRY E. WHEELER, Dept. of Botany, Louisiana State University, Baton Rouge, La. 70803
- MARTHA H. WHICKER, Box 258, Walkertown, N. C. 27051
- DENNIS F. WHIGHAM, 106 Northampton Terrace Apts., Chapel Hill, N. C. 27514
- ALAN G. C. WHITE, Department of Biology, Virginia Military Institute, Lexington, Va. 24450
- JACKSON H. WHITE, Rt. 2, Box 6A, Ferrum, Va. 24088
- JESSE S. WHITE, 118 W. Sunflower Rd., Cleveland, Mississippi 38732
- JOHN C. WHITE, JR., Radiobiological Lab., U. S. Dept. of Interior, Beaufort, N. Car. 28516
- ORLAND E. WHITE, 1708 Jefferson Park Road, Charlottesville, Va. 22903
- L. A. WHITFORD, Box 5186, State College Station, Raleigh, N. C. 27607
- ANNA R. WHITING, 535 W. Vanderbilt Dr., Oak Ridge, Tenn. 37830
- PHINEAS W. WHITING, ORNL, Biology Division, P. O. Box Y, Oak Ridge, Tenn. 37830
- JOHN B. WHITNEY, Botany Dept., Clemson University, Clemson, S. Car. 29631
- MONA McLUNG WHITSON, Dept. of Biology, Mississippi State Coll. for Women, Columbus, Miss. 39701
- SHIRLEY K. WHITT, Department of Biology, Lynchburg College, Lynchburg, Va. 24504
- DEAN P. WHITTIER, Department of Biology, Vanderbilt University, Nashville, Tenn. 37203
- MAURICE WHITTINGHILL, Dept. of Zoology, Univ. of North Carolina, Chapel Hill, No. Car. 27514
- THOMAS E. WILBANKS, Department of Biology, Shorter College, Rome, Ga. 30161
- C. D. WILDER, JR., Dept. of Biology, V.P.I., Blacksburg, Virginia 24061
- EDWIN L. WILES, Southern Pilgrim College, Kernersville, N. C. 27284
- DORA P. WILEY, P. O. Box 883, Moncks Corner, S. C. 29461
- JAMES C. WILKES, JR., Dept. of Biology, Troy State College, Troy, Ala. 36081
- PEARL W. WILKES, Dept. of Biology, Troy State College, Troy, Ala. 36081
- ALBERT A. WILL, JR., Junior College of Broward County, 2501 Davie Road, Ft. Lauderdale, Fla. 33314
- WILLIAM K. WILLARD, Dept. of Entomology & Zoology, Clemson University, Clemson, S. C. 29631
- BILLY J. WILLIAMS, c/o Post Office, Midland City, Ala. 36350
- DONALD B. WILLIAMS, 21 Cedar Avenue, Poughkeepsie, N. Y. 12603
- JERRY P. WILLIAMS, 8710 Sycamore St., Fairchild AFB, Washington 99011
- LOUIS G. WILLIAMS, Dept. of Biology, P. O. Box 1927, University, Alabama 35486
- RICHARD B. WILLIAMS, Building 2001, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830
- ROBERT A. WILLIAMS, 180 Virginia Avenue, Athens, Ga. 30601
- ROBERT H. WILLIAMS, P. O. Box 8263, University of Miami, Coral Gables, Fla. 33124
- FRANK F. WILLINGHAM, JR., Dept. of Biology, Wake Forest College, Winston-Salem, N. C. 27106
- JAMES N. WILLIS, III, Pollution Studies Dept., U. S. Radiobiological Lab., Beaufort, No. Car. 28516
- CAMILLA L. WILLIS, 1601 Grady Ave., Charlottesville, Va. 22903
- WIRT H. WILLS, Dept. of Plant Path. & Physiology, Virginia Polytechnic Institute, Blacksburg, Va. 24061
- BILLY WILSON, Box 1524, Station B, Vanderbilt University, Nashville, Tenn. 37203
- EVA JOHNSON WILSON, 3300 Rockingham Drive, N.W., Atlanta, Ga. 30327
- JAMES L. WILSON, 2500 Woodberry Drive, Nashville, Tenn. 37214
- GRACE T. WILTSHIRE, 201 Woodland Ave., Lynchburg, Va. 24503
- LARRY T. WIMER, Dept. of Biology, University of South Carolina, Columbia, So. Car. 29208
- ERWIN B. WINGFIELD, Rte. 1, Box 224, Blacksburg, Va. 24060
- CYRUS W. WISER, Dept. of Biology, Middle Tennessee State College, Murfreesboro, Tenn. 37130
- JOHN D. WITHERS, Dept. of Biology, Clark College, Atlanta, Ga. 30314
- JOHN P. WITHERSPOON, JR., Radiation Ecology Section, Bldg. 2001, X-10 Plant, Oak Ridge, Tenn. 37830
- B. EUGENE WOFFORD, Department of Biological Sciences, University of South Alabama, Mobile, Ala. 36608
- F. A. WOLF, Duke University, Durham, N. C. 27706
- FRANK W. WOODS, School of Forestry, Duke University, Durham, N. C. 27706
- FRED T. WOLF, Dept. of Biology, Vanderbilt University, Nashville, Tenn. 37203
- ALFRED M. WOLFSON, Dept. of Biological Science, Box 1229 College Station, Murray State College, Murray, Ky. 42071
- CARROLL E. WOOD, JR., Harvard University Herbarium, 22 Divinity Ave., Cambridge, Mass. 02138
- MARY E. WOOD, Chowan College, Murfreesboro, N. C. 27855
- ROBERT A. WOODMANSEE, Dept. of Biology, Univ. of South Alabama, 307 Gaillard Drive, Mobile, Ala. 36608
- WILLIAM S. WOOLCOTT, JR., Box #248, University of Richmond, Richmond, Virginia 23173
- JOHN D. WOOLEVER, 2250 Worrington, Sarasota, Fla. 33581
- NANCY L. WORLEY, Department of Botany, North Carolina State University, Raleigh, N. C. 27607
- J. WALLACE WORMLEY, Box 251, Grambling, La. 71245
- C. PAUL WRIGHT, Department of Biology, Western Carolina University, Cullowhee, N. C. 28723
- VIRGINIA KATHLEEN WRIGHT, Department of Biology, Emory University, Atlanta, Ga. 30322

GAIL G. WYNN, 2640 Wisteria Street,
New Orleans, La. 70122
LINDA L. WYNNE, 1214 Woodland Ave.,
N.E., Apt. 8, Atlanta, Ga. 30306

Y

FATHER P. H. YANCEY, Spring Hill
College, Spring Hill, Ala. 36608
ROBERT M. YANCEY, Bur. Comm. Fish.,
Biology Laboratory, Oxford, Md.
21654
JAMES D. YARBROUGH, Box 1927, Uni-
versity, Alabama 35486
JOHN A. YARBROUGH, Dept. of Bi-
ology, Meredith College, Raleigh,
N. C. 27602
BERNARD H. YATES, 2186 Clairmont
Road, Decatur, Ga. 30033
HARRIS O. YATES, Meadow Lake Road,
R. 2, Brentwood, Tenn. 37027
FRED YEATS, Dept. of Biology, Univer-
sity of S. C., Columbia, S. C. 29208
RALPH W. YERGER, Dept. of Biological
Sciences, Florida State University,
Tallahassee, Fla. 32306
PAUL YOKLEY, JR., Dept. of Biology,
Florence State College, Florence, Ala.
35630
MARTIN D. YOUNG, Gorgas Memorial
Laboratory, Box 2016, Balbo Heights,
Canal Zone

Z

RHONDA D. ZAGER, 6127 Cherry Hill
Drive, Columbus, Ohio 43213
ARTHUR W. ZIEGLER, 5600 Beam Court,
Bethesda, Maryland 20034
ELIZABETH M. ZIPF, 316 Kingston Ave.,
Barrington, N. J. 08007

LIBRARIES

ALEXANDER CITY STATE JR. COLLEGE,
Box 699, Alexander City, Ala. 35010
AMERICAN MUSEUM OF NAT'L HIS-
TORY, Central Park West at 79th
Street, New York, N. Y. 10024
AUBURN UNIVERSITY, Serials Section,
Auburn, Ala. 36830
CLEMSON UNIVERSITY, Clemson, S. C.
29631
DUKE UNIVERSITY, Durham, North
Carolina 27706
EAST CAROLINA COLLEGE, Greenville,
N. C. 27834

EMORY UNIVERSITY, Atlanta, Ga. 30322
FLORIDA STATE UNIVERSITY, Tallahas-
see, Fla. 32306
GEORGIA SOUTHERN COLLEGE, States-
boro, Ga. 30458
GULF COAST RESEARCH LAB., Ocean
Springs, Mississippi 39564
HAMPDEN-SYDNEY COLLEGE, Hampden-
Sydney, Va. 23943
HIGHLANDS BIOLOGICAL STATION,
Highlands, North Carolina 28741
LITTLE ROCK UNIVERSITY, Little Rock,
Arkansas 72204
LOUISIANA STATE UNIV., Baton Rouge,
La. 70803
MARINE BIOLOGICAL LABORATORY,
Woods Hole, Mass. 02543
METHODIST COLLEGE, Box 592, Fayette-
ville, N. C. 28301
MIDDLE TENNESSEE STATE COLLEGE,
Murfreesboro, Tenn. 37130
MISSISSIPPI STATE UNIVERSITY, State
College, Miss. 39762
MOBILE COLLEGE, P. O. Box 13220,
Mobile, Ala. 36601
MT. LAKE BIOLOGICAL STATION, Uni-
versity of Virginia, Route #1, Pem-
broke, Va. 24136
U. S. DEPT. OF AGRICULTURE, National
Agricultural Library, Current Serial
Records, Washington, D. C. 20250
NATIONAL LAND LIB. FOR SPACE &
TECH., Boston Spa, Yorkshire, England
NATIONAL REF. LIBRARY, SCIENCE &
INVENTION — BAYSWATER DIV., Por-
chester Gardens, London, W. 2, Eng-
land
NATURAL HISTORY MUSEUM, Cromwell
Road, London S. W. 7, England
NEW YORK BOTANICAL GARDEN,
Bronx, New York 10458
NORTH CAROLINA STATE UNIVERSITY,
Raleigh, N. Car. 27607
NORTHEAST LOUISIANA STATE COL-
LEGE, Monroe, La. 71201
OAK RIDGE NATIONAL LABORATORY
BIOLOGY LIBRARY, Bldg. 9207, P. O.
Box Y — 34X-31230, Oak Ridge, Tenn.
37830
OHIO STATE UNIV., 1858 Neil Ave.,
Columbus, Ohio 43210
SOUTHERN METHODIST UNIVERSITY,
Dallas, Texas 75222
TENNESSEE POYTECHNIC INSTITUTE,
Cookeville, Tenn. 38501
TENNESSEE WESLEYAN COLLEGE,
Athens, Tennessee 37303

TENNESSEE WESLEYAN COLLEGE, Athens,
Tennessee 37303
UNIVERSITY OF ALABAMA, P. O. Box
6253, University, Ala. 35486
UNIVERSITY OF CALIFORNIA, Berkeley,
Calif. 94720
UNIVERSITY OF CALIFORNIA, SAN
DIEGO, La Jolla, Calif. 92037
UNIVERSITY OF FLORIDA, Gainesville,
Fla. 32601
UNIVERSITY OF GEORGIA, Athens, Ga.
30601
UNIVERSITY OF HAWAII, Honolulu,
Hawaii 96822
UNIV. OF ILLINOIS, Urbana, Ill. 61801
UNIV. OF KENTUCKY, Lexington, Ken-
tucky 40506
UNIVERSITY OF MIAMI, Coral Gables,
Fla. 33146
UNIVERSITY OF MISSOURI, Columbia,
Mo. 65201
UNIVERSITY OF SOUTH FLORIDA,
Tampa, Fla. 33620
UNIVERSITY OF TEXAS, Austin, Texas
78712
WAYNE STATE UNIVERSITY, Detroit,
Mich. 48202
WINTHROP COLLEGE, Rock Hill, S. C.
29730

MISCELLANEOUS

BIOLOGICAL ABSTRACTS, 2100 Arch
Street, Philadelphia, Pa. 19103
BUREAU OF COMMERCIAL FISHERIES,
Biological Station, 75-33rd Ave., St.
Petersburg Beach, Florida 33706
BUREAU OF COMMERCIAL FISHERIES,
U. S. Dept. of Interior, Fish & Wildlife
Service, Biology Laboratory, Oxford,
Maryland 21654
CAROLINA BIOLOGICAL SUPPLY CO.,
Burlington, North Carolina 27215
FILIAL BIBLIOTEKI, Akademii Nauk
SSSR, Baltijskaja Ul. 14, Moskva D-
219, USSR
OAK RIDGE INSTITUTE OF NUCLEAR
STUDIES, U. S. Atomic Energy Com-
mission, Midway Warehouse No. 2,
P. O. Box 117 Oak Ridge, Tenn. 37830
SOUTHERN PRECISION INST. CO., 710
Augusta St., San Antonio, Texas
78215
TRENDS PUBLISHING, INC., National
Press Bldg., Washington 4, D. C.
20004
WILL CORPORATION OF GEORGIA,
Atlanta, Georgia 30301

The ASB

BULLETIN

Volume 16, Number 2

April 1969



JAPANESE CHERRY TREE — Atlanta, Ga.

Clarence E. Styron

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy L. Crandall, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Georgia College, Milledgeville, Georgia 31061. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. WILLARD HART, JR.
EDITOR

DOROTHY L. CRANDALL
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

JOHN CARPENTER, Business Manager

OFFICERS OF THE ASB

President — Robert B. Short, Florida State University

Retiring President — Harold J. Humm, University of South Florida

President Elect — John M. Carpenter, University of Kentucky

Vice-President — James W. Hardin, North Carolina State University

Secretary — Dorothy L. Crandall, Randolph Macon Woman's College

Treasurer — David J. Cotter, Georgia College

Executive Committee — Albert E. Radford, University of North Carolina; John D. McCrone, University of Florida; Richard E. Garth, Northwestern State College; Grover C. Miller, North Carolina State University; Burton J. Bogitsh, Vanderbilt University; Anna Josephine Bridgman, Agnes Scott College. All officers are ex officio members of the executive committee.

RESOLUTIONS COMMITTEE

Fred K. Parrish, Georgia State College
Burton J. Bogitsh, Vanderbilt Univ.
Elsie Quarterman, Vanderbilt Univ., Chairman



CONTENTS

Association Affairs	30
Program of the 30th Annual Meeting of the ASB	31
Abstracts of Papers Presented at the 30th Annual Meeting of the ASB	42
Index and Title Page for Volumes 11 - 15 i-viii (following p. 52)	
News of Biology in the Southeast	74

ASSOCIATION AFFAIRS

The Nominating Committee has selected the following slate of nominees for the various ASB offices that will be vacated this year. Voting will take place at the Business Meeting of the ASB, which will be held at 11:45 A.M., Friday, April 18, in the ballroom of University Center. Short biographical sketches of the nominees are given on page 76.

President Elect

B. Theodore Cole

C. Willard Hart, Jr.

Vice-President

Burton J. Bogitsh

James N. Dent

Executive Committee

Perry C. Holt

J. H. Mullahy

W. J. Koch

Charles Ray, Jr.

Continued on page 75

Program of the 30th Annual Meeting of the Association of Southeastern Biologists Memphis State University, Memphis, Tennessee

A joint meeting with the Southeastern Section of the Botanical Society of America, the Southern Appalachian Botanical Club, Southeastern Division of the American Society of Ichthyologists and Herpetologists, and the Southeastern Region of Beta Beta Beta National Honorary Biological Society.

THURSDAY, APRIL 17

- 8:00- 5:00 Department of Biology Open to Visitors: Information and directions may be obtained at the registration desk or Room 103, Ellington Biological Sciences Building.
- 1:30 Executive Committee Meeting, Association of Southeastern Biologists: Room 303A, University Center.
- 2:00-11:00 Exhibits: Third Floor Lounge, University Center.
- P.M.
- 4:00- 7:15 A.S.B. Registration. Third Floor Lobby, University Center.
- and
after Gen.
Session
until 10:00 Placement Service Registration: 303K University Center.
- 7:30 A.S.B. General Session: Ballroom, University Center.
Address of Welcome: Dr. C. C. Humphreys, President, Memphis State University.
Response: Dr. Robert B. Short, President, The Association of Southeastern Biologists.
Smoker: Third Floor Lobby and Lounge.

FRIDAY, APRIL 18

- | | | | |
|------------|---|------------|---|
| 7:00 | Joint Breakfast and Business Meeting for Southeastern Section, Botanical Society of America and Southern Appalachian Botanical Club: University Center. | | <i>Invertebrate Zoology</i> — Room 303H, University Center. |
| 8:00- 5:00 | Department of Biology Open to Visitors. | | <i>Ichthyology & Herpetology</i> — Ellington Biological Sc. Bldg., Auditorium. |
| 8:00-11:45 | A.S.B. Registration: Third Floor Lobby, University Center. | 11:15 | Business Meeting, Southeastern Association of Parasitologists: Room 303J, University Center. |
| 8:00-10:00 | Placement Service Registration: Room 303K, University Center. | | |
| 8:00- 5:00 | Exhibits: Third Floor Lounge, University Center. | 11:15 | Business Meeting, Southeastern Division of American Society of Ichthyologists & Herpetologists. Auditorium, Ellington Biological Sciences Building. |
| 8:00- 9:00 | Beta Beta Beta Registration: Main Lobby, Ellington Biological Sciences Building. | | |
| 9:00 A.M. | ASB Past Presidents Meeting: Place to be announced. | 11:45 | Business Meeting, Association of Southeastern Biologists: Ballroom, University Center. |
| 9:00-11:45 | Beta Beta Beta Paper Sessions: | | |
| A.M. | <i>Eastern Division</i> — Room 105, Ellington Biological Sciences Building. | 1:00- 2:00 | Beta Beta Beta General Meeting: Room 131, Ellington Biological Sciences Building. |
| | <i>Western Division</i> — Room 131, Ellington Biological Sciences Building. | | |
| 8:30-11:30 | Paper Sessions: | 2:00- 5:30 | Paper Sessions: |
| | <i>Plant Autecology</i> — Room 303B, University Center. | | <i>Ichthyology & Herpetology</i> — Ellington Biological Sciences Building, Auditorium. |
| | <i>Plant Ecology</i> — Room 303C, University Center. | | <i>Animal Ecology</i> — Room 303B, University Center. |
| | <i>Plant Systematics, Floristics and Morphology</i> — Room 303D, University Center. | | <i>Plant Ecology</i> — Room 303C, University Center. |
| | <i>Cryptogamic Botany</i> — Room 303E, University Center. | | <i>Plant Systematics, Floristics, and Morphology</i> — Room 303D, University Center. |
| | <i>Cytology</i> — Room 303F, University Center. | | <i>Experimental Botany</i> — Room 303E, University Center. |
| | <i>Animal Physiology and Experimental Zoology</i> — Room 303G, University Center. | | <i>Genetics</i> — Room 303F, University Center. |

Animal Physiology & Experimental Zoology — Room 303G, University Center.

Parasitology and Histology — Room 303H, University Center.

7:00 P.M. A.S.B. Banquet and Presentation of Awards: Ballroom, University Center.

Association Research Prize. Sponsored by Carolina Biological Supply Company.

Meritorius Teaching Award. Sponsored by Will, Scientific, Inc., Georgia.

Past President's Address: Harold J. Humm — *Marine Algae in Our Present and Future*.

SATURDAY, APRIL 19

8:00 A.M. Field Trips: Details at registration desk. Please sign up during registration.

1. Botany trip to Meeman Biological Field Station and Meeman-Shelby Forest. Led by Dr. Edward T. Browne, Jr.

2. Ornithology trip to Meeman Biological Field Station. Led by Mr. R. W. McGowan.

8:00-12:00 Department of Biology Open to Visitors: Information at registration desk.

8:00-11:00 Exhibits: Third Floor Lounge, University Center.

8:30 A.M. Executive Committee Meeting, Association of Southeastern Biologists: Room 303A University Center.

SCHEDULE OF PAPER SESSIONS

FRIDAY MORNING — APRIL 18

PLANT AUTECOLOGY

Room 303 B, University Center

Presiding: Dr. George S. Ramseur, University of the South

- | | | | |
|------|--|-------|---|
| 8:30 | 1. SHARPLEY, J. MILES AND D. G. KESSEL (Virginia Commonwealth University and Sharpley Laboratories, Inc.). Accumulation of Metals by Fungi II. Zinc, Iron and Yttrium Group. | | |
| 8:43 | 2. MILLER, MERCER D. AND JOE A. EDMISTEN (University of Georgia). Nitrogen Fixing Ability of <i>Ceanothus americanus</i> . | 10:01 | 8. HESS, LLOYD W. (Savannah River Ecology Laboratory) and DAVID B. DUNN (University of Missouri). The Use of Neutron Activation Analysis in a Phylogenetic Study of Seed Mineral Content. |
| 8:56 | 3. BASKIN, JERRY M. (University of Kentucky). Amino Acids and Amides in Diffusate of <i>Psoralea subacaulis</i> Seeds. | 10:14 | 9. BURBANCK, MADELINE P. (Emory University). Loblolly Pine (<i>Pinus taeda</i> L.) as an Invader of Granite Outcrop Island Communities. |
| 9:09 | 4. BASKIN, CAROL C. AND JERRY M. BASKIN (University of Kentucky). Germination Requirements of <i>Cyperus inflexus</i> . | 10:27 | 10. COOPER, ARTHUR W. (North Carolina State University). Net Primary Productivity of Young Big Tooth Aspen (<i>Populus grandidentata</i>) stands in Cheboygan County, Michigan. |
| 9:22 | 5. BOULWARE, MARGARET A. AND JOE A. EDMISTEN (University of Georgia). Capability of Nitrogen Fixation by the Coralloid Roots of <i>Zamia floridana</i> . | 10:40 | 11. GIBBON, EDWARD L. (North Carolina State University). The Ecological and Taxonomic Distinctness of <i>Carya carolinae-septentrionalis</i> and <i>Carya ovata</i> in the Southeast. |
| 9:35 | 6. HUNNICUTT, KERMIT AND JOE A. EDMISTEN (University of Georgia). Nitrogen Fixation in <i>Elaeagnus umbellata</i> . | 10:53 | 12. McDONALD, JAMES C. (Wake Forest University). An Unusual Habitat for <i>Stemonitis splendens</i> (Myxomycetes). |
| 9:48 | 7. HERFORD, J. ROBERT AND JOE A. EDMISTEN (University of Georgia). Preliminary Studies of Nitrogen Fixation on a Granite Outcrop. | | |

PLANT ECOLOGY

Room 303 C, University Center

Presiding: Dr. William A. Thomas, Oak Ridge National Laboratory

- | | | | |
|------|--|-------|---|
| 8:30 | 13. KELLY, JEROME (University of Miami) AND MORRIS F. CRANMER (Pesticide Research Laboratory, USPHS, Perrine, Florida). Pesticide Flow Through a Model Fresh-water Ecosystem. | 9:48 | 19. STROUD, LINDA M. AND ARTHUR W. COOPER (North Carolina State University). Net Primary Productivity of a Regularly-flooded North Carolina Salt Marsh. |
| 8:43 | 14. KELLY, JEROME, PETER RHOADS, DOUGLAS SCHNEIDER, AND RICHARD SMITH (University of Miami). Pesticide Residues in a South Floridian Agricultural District Canal. | 10:01 | 20. PATTON, E. GIBBS (Wofford College). Location and Association of Shrubs in a Forest Community: a Statistical Analysis. |
| 8:56 | 15. RHOADS, PETER B. (University of Miami). Aspects of Phytoplankton Primary Production in a Shallow, South Florida Lake. | 10:14 | 21. WRIGHT, V. K. (Emory University). Competition on Granite Outcrops between Two Species of <i>Talinum</i> . |
| 9:09 | 16. RHOADS, PETER, PATRICK COLIN, JOHN BEERS, AND HOWARD TEAS (University of Miami). Aerial Photoecology of South Florida Patch Reefs. | 10:27 | 22. SMITH, RICHARD C. (University of Miami). Effect of a Heated-Water Discharge on the Distribution of Benthos in a Portion of Biscayne Bay, Florida. |
| 9:22 | 17. DANIEL, CHARLES (Georgia College). Old Field Succession Six Years After Significant Gamma-Neutron Radiation Exposure. | 10:40 | 22a. FOSTER, W. A. (N.C. State Univ.) An Example of the Use of Color Infrared Aerial Photography for Salt Marsh Gradient Analysis. |
| 9:35 | 18. NICHOLSON, STUART A., CARL D. MONK, AND GEORGE I. CHILD (University of Georgia). The Measurement of Vascular Plant Species Diversity in an Oak-hickory Community in the Piedmont of Georgia. | | |

PLANT SYSTEMATICS, FLORISTICS, AND MORPHOLOGY

Room 303 D, University Center

Presiding: Dr. R. B. Channel, Vanderbilt University

- | | | | |
|------|--|-------|--|
| 8:30 | 23. WARRINGTON, SARAH AND E. T. BROWNE, JR. (Memphis State University). The Vascular Plants of Tipton County, Tennessee. | | |
| 8:43 | 24. MORTON, GARY H. (University of Tennessee). The Influence of Different Mounting Techniques on the Size and Shape of Pollen Grains of <i>Solidago boottii</i> (Asteraceae: Asterales: Angiospermae). | 9:48 | 29. ELLIS, TIM T. AND VARLEY E. WEIDEMAN, (University of Louisville). Description and Breaking of Dormancy in Corms of Jack-in-the-Pulpit (<i>Arisaema</i> Spp.). |
| 8:56 | 25. YEATS, FRED T. AND J. M. HERR, JR. (University of South Carolina). The Ovule and Megagametophyte of <i>Smilax walteri</i> Pursh. | 10:01 | 30. BELL, RITCHIE C. (University of North Carolina). Variation and Selection Pressure in <i>Aquilegia caerulea</i> James (Ranunculaceae). |
| 9:09 | 26. DICKISON, WILLIAM C. (Virginia Polytechnic Institute). Phylogenetic and Systematic Significance of Leaf Vascularization in Dilleniaceae (Angiospermae: Dicotyledoneae). | 10:14 | 31. WHITTIER, DEAN P. (Vanderbilt University). Quantitative Differences Between Gemetophytes of Ferns with Sexual and Apogamous Reproduction. |
| 9:22 | 27. WATSON, J. RAY (Mississippi State University). The Arborescent Flora of Mississippi. | 10:27 | 32. ROGERS, HOLLIS J. AND RALPH M. MORRISON (University of North Carolina at Greensboro). White Flowering Partridge Pea in North Carolina. |
| 9:35 | 28. REYNOLDS, JOHN D. (Virginia Commonwealth University) AND SAM B. JONES, JR., (University of Georgia). Microsporangogenesis in <i>Vernonia angustifolia</i> Michx. (Compositae). | 10:40 | 33. LELONG, MICHEL G. (University of South Alabama). A Floristic Study in Mobile, Alabama. |

CRYPTOGAMIC BOTANY

Room 303 E, University Center

Presiding: Dr. W. W. Scott, Eastern Illinois University

- | | | | |
|------|--|------|---|
| 8:30 | 34. KIMBROUGH, J. W. (University of Florida). <i>Antennopsis gallica</i> Heim and Buchli, (Hyphomycetes: Gloeohaustoriales), An Entomogenous Fungus on Subterranean Termites in Florida. | 9:09 | 37. AKERS, STUART W. AND CHARLES E. ANDERSON (North Carolina State University). The Effect of Fluoride on <i>Chlamydomonas reinhardtii</i> . |
| 8:43 | 35. HALE, MASON E. (Smithsonian Institution). Single Lobe Growth Patterns in <i>Parmelia caperata</i> (Lichens). | 9:22 | 38. THOMAS, DEMPSEY L. (Louisiana State University in New Orleans). Serological Relationship of <i>Protosiphon</i> to Selected Chlorophycean and Xanthophycean Algae. |
| 8:56 | 36. SIMS, ASA C. (Southern University in New Orleans). Toxins of Single Spore Isolates of <i>Pellicularia filamentosa</i> . | 9:35 | 39. HOUSTON, M. R., I. McVEIGH, R. NEAL AND W. N. PEARSON (Vanderbilt University). Biosynthesis of Thiamine by <i>Phycomyces blakesleeanus</i> . |

- 9:48 40. DRAKE, BOBBY F. AND VICTOR E. FEISAL (Memphis State University). Threonine Deaminase Feedback Inhibition in A Pseudomonad Species.
- 10:01 41. MANIGAULT, WALTER WM., LAFAYETTE FREDERICK AND THOMAS W. COLE, JR. (Atlanta University). A Study of Aflatoxin Production by Isolates of *Aspergillus flavus*.
- 10:14 42. KOCH, WILLIAM J. (University of North Carolina at Chapel Hill). Further Aspects of Flagellar Retraction in Fungi.
- 10:27 43. WOLF, E. T., AND S. K. HASIJA (Vanderbilt University). A New Species of *Cintractia* on *Fuirena* (Cyperaceae).
- 10:40 44. NESOM, MARGARET GREEN (University of North Carolina). Observations on the Distribution of Certain Aquatic Phycomycetes in Granite Outcrop Soil.

CYTOLOGY

Room 303 F, University Center

Presiding: Dr. A. V. Beatty, Emory University

- 8:30 45. REAMS, WILLIE M. AND STANLEY P. TOMPKINS (University of Richmond and The Medical College of Virginia). An EM Study of the Dendritic Keratinocytes of the PET Mouse.
- 8:43 46. LEMBI, CAROLE A. AND PATRICIA L. WALNE (University of Tennessee, Knoxville). Interconnections Between Cytoplasmic Microtubules and Basal Bodies of Tetraporalean Pseudocilia (Chlorophyta, Chlorophyceae, Tetrasporales).
- 8:56 47. RAO, R. D. (North Carolina State University). Ultrastructure of *Spirodela Polyrhiza* (L.) Schleiden. I. Raphides and the Idoblast.
- 9:09 48. RAO, R. D. (North Carolina State University). Ultrastructure of *Spirodela Polyrhiza* (L.) Schleiden. II. Chloroplast Development During Turion Germination.
- 9:22 49. DAVIS, JOANNE T., AND CLINTON J. DAWES (University of South Florida). Ultrastructure Studies of Several Marine Dinoflagellates (Division: Pyrrophyta).
- 9:35 50. DAWES, CLINTON J. (University of South Florida). An Ultrastructural Study of the Colorless Green Alga, *Saprochaete saccharophila* Coker and Shanor (Chlorophyceae, Chaetophorales, Saprochaetaceae).
- 9:48 51. PERKINS, FRANK O. (Virginia Institute of Marine Science). Fine Structure of Centriole Formation in *Labyrinthula* sp. (Rhizopodea, Labyrinthulida).
- 10:01 52. FLOYD, JOSEPH C. AND FELIX H. LAUTER (University of South Carolina). A Morphological and Cytochemical Study of *Tritrichomonas augusta* (Alexeieff) 1911.
- 10:14 53. LUNDQUIST, LEONARD E. AND FELIX H. LAUTER (University of South Carolina) AND WILLIAM G. DOUGERTY AND MARY M. LEE (Medical College of South Carolina). Ultrastructural Studies From a Free Living Juvenile Form of *Rhabdias ranae*, Walton 1929.
- 10:27 54. PALISANO, JOHN R. AND PATRICIA L. WALNE (University of Tennessee, Knoxville). Ultrastructural Aspects of Senescence in *Euglena granulata* with Special Reference to the Eyespot (Euglenophyceae, Euglenales).
- 10:40 55. BROWN, GEORGE GORDON (Iowa State University and Virginia Institute of Marine Science) AND ROSS L. SHOGER (Carleton College). Some Ultrastructural Aspects of Sperm-egg Interactions in the Horseshoe Crab, *Limulus polyphemus* (Merostomata: Xiphosura).
- 10:53 56. WALNE, PATRICIA L. AND CAROLE A. LEMBI (University of Tennessee, Knoxville). Ultrastructural and Time-lapse Studies of *Trachelomonas*, *Lepocinclis*, and *Euglena* (Euglenophyceae, Euglenales) with Special Reference to Eyespots.

ANIMAL PHYSIOLOGY AND EXPERIMENTAL ZOOLOGY

Room 303 G, University Center

Presiding: Dr. W. W. Gibson, LeMoyne College

- 8:30 57. LUMB, ROGER H. (Western Carolina University). Glycerol Ether Content of Five Species of Insects.
- 8:43 58. SAMUELS, KEITH T., JR. AND R. W. HULL (Florida State University). The Role of Sterols in Photodynamic Response.
- 8:56 59. WILLARD, WILLIAM K. (Clemson University). Radiosensitivity and Regulation of Population Density in the Yellow Fever Mosquito (*Aedes aegypti*).
- 9:09 60. FLEMING, DIANE OAKERSON (Memphis State University). *In vitro* Experimental Effects of Radiocobalt 60 on Rabbit Polymorphonuclear Leucocytes.
- 9:22 61. STOKES, BETTYE R. (Atlanta University) AND CLYDE E. JOHNSON, JR. (Clark College). The Effects of Nitrate and Chloride Ions on Motility, Glucose and Oxygen Utilization in Rabbit Spermatozoa.

- 9:35 62. BELL, RONDAL E. (Millsaps College). Serum Protein Alterations in Hormonally Induced Polyarteritis Nodosa as Revealed by Electrophoresis.
- 9:48 63. KIMBROUGH, T. DANIEL (Virginia Commonwealth University). Age Difference as a Factor in the Assay of the Effect of 5-HT on Gut Mobility in the Rat.
- 10:01 64. OLEWINE, DONALD A. AND FRANK H. RAMSEY (Georgia Southern College). The Effect of Light Jogging on Cardiovascular Fitness.
- 10:14 65. NELSON, F. KIRK (Memphis State University). Changes in Rat Serum Protein Patterns under Combinations of Fasting and Electric Shock.
- 10:27 66. SIMS, MICHAEL H., DEASON C. DUNAGAN, AND GEORGE W. TATE, JR. (Memphis State University). An Assay for FSH in the Golden Hamster.
- 10:40 67. FARMER, MATTIE D. AND GEORGE W. TATE, JR. (Memphis State University). Preliminary Investigations of Protein-bound Iodine in the Mongolian Gerbil. (*Meriones unguiculatus*).

INVERTEBRATE ZOOLOGY

Room 303 H, University Center

Presiding: Dr. Clay M. Chandler, Bethel College

- 8:30 68. RYAN, EDWARD PARSONS (East Carolina University). Morphology of the Male Reproductive System in the Hawaiian Kona Crab, *Ranina ranina* (L.) (Decapoda: Gymnopleura).
- 8:43 69. HAYES, JOHN T. (Savannah River Ecology Laboratory). Growth Parameters and Notes on the Biology of *Bittacomorpha clavipes* (Fab.) (Insecta: Diptera: Ptychopteridae).
- 8:56 70. GENTRY, JOHN B. (University of Georgia). Notes on the Migratory Behavior of the Southern Harvester Ant (*Pogonomyrmex badius*).
- 9:09 71. MCGHEE, CHARLES R. (Virginia Polytechnic Institute). The Genus *Mesesoma* Weed (Phalangida, Arachnida) of North America.
- 9:22 72. SCHMOLLER, RONALD R. (The University of Tennessee). Life Histories of Wolf Spiders (Lycosidae: Araneae: Arachnida) in the Alpine Tundra of Colorado.
- 9:35 73. DAVIS, JOHN D. (Mississippi State College for Women). Courtship and Intermale Behavior of the Jumping Spider, *Zygoballus bettini* Peckham.
- 9:48 74. APPLGATE, ARTHUR L. (Western Kentucky University). Collection and Characterization of the Venom of *Loxosceles reclusus* (Arachnida).
- 10:01 75. YOKLEY, PAUL, JR. (Florence State University). Life History of *Pleurobema cordatum* (Rafinesque, 1820).
- 10:14 76. HOOVER, RICHARD L. AND STEPHEN M. GITTESON (University of Kentucky). The Protozoa of Mammoth and Great Onyx Caves, Kentucky.
- 10:27 77. SIMPSON, TOM AND R. W. HULL (Florida State University). Suctorina in Culture.
- 10:40 78. LONGEST, WILLIAM D. (The University of Mississippi). Additions to the Distribution of *Cura foremani* (Girard, 1852) in the Eastern United States.
- 10:53 79. BELL, RONDAL E. (Millsaps College) AND JULIAN C. GRUBBS (University of Tennessee Medical Center). A Systematic Study of Planarian Species Utilizing Cellulose Polyacetate Electrophoresis.
- 11:06 80. MILLICAN, TROY AND Y. J. MCGAHA (The University of Mississippi). A Study of the Bottom Fauna of Sardis Reservoir in Relation to Biological Productivity.
- 11:19 81. KNIGHT, LUTHER A. AND Y. J. MCGAHA (The University of Mississippi). Rotifers (Rotifera) of Four Flood Control Reservoirs in Northern Mississippi.

ICHTHYOLOGY AND HERPETOLOGY

Auditorium, Ellington Biological Sciences Building

Presiding: Dr. Crawford G. Jackson, Jr., Mississippi State College for Women

- 8:30 82. JACKSON, MARGUERITE M., MACDONALD FULTON AND CRAWFORD G. JACKSON, JR. (Mississippi State College for Women). A Survey of the Enteric Bacteria (Enterobacteriaceae) of Chelonians: Preliminary Findings.
- 8:45 83. IRELAND, PATRICK H. (University of Arkansas). Reproduction and Growth of *Ambystoma annulatum* larvae.
- 9:00 84. MURPHY, GEORGE G. (Mississippi State University). Sun-cued Orientation in Red-eared Turtles, *Pseudemys scripta elegans*.
- 9:15 85. TAYLOR, DOUGLAS H. (Mississippi State University). Solar Cues in Orientation of the Cricket Frog, *Acris gryllus*.
- 9:30 86. FOLKERTS, GEORGE W. (Clemson University). Selection and the Identity of the *Desmognathus fuscus* Races in the Southeastern United States.
- 9:45 87. SCHWANER, TERRY D. AND ROBERT H. MOUNT (Auburn University). Notes on Distribution and Ecology of *Phaeognathus hubrichti* Highton.

- 10:00 88. POWDERS, VERNON N. AND WILLIAM L. TIETJEN (Georgia Southwestern College). Food Habits of *Plethodon jordoni* (Amphibia: Plethodontidae).
- 10:15 89. OUTTEN, L. M. (Mars Hill College). Some Salamanders from Western North Carolina and Adjoining Areas (Amphibia: Urodela).
- 10:30 90. GIBBONS, J. WHITFIELD (Savannah River Ecology Laboratory). Structure and Dynamics of the Yellow-bellied Turtle, *Pseudemys scripta* (Reptilia: Chelonia: Emydidae) in an Artificially Heated Reservoir.
- 10:45 91. HARDIN, JAMES W., MICHAEL J. HARVEY (Memphis State University), ROGER W. BARBOUR, AND JAMES P. SCHAFER (University of Kentucky). Movements and Activity Patterns of the Dusky Salamander, *Desmognathus fuscus* (Amphibia: Caudata: Plethodontidae).
- 11:00 92. DOLBEER, RICHARD A. (University of Tennessee). Population Density and Home Range Size of the Eastern Box Turtle (*Terrapene c. carolina*) in Eastern Tennessee.
- 11:15 93. STILES, ROBERT A. AND DAVID A. ETNIER (University of Tennessee). Fishes of the Upper Conasauga River, Polk and Bradley Counties.
- 11:30 94. COMISKEY, CHARLES (University of Tennessee). Fishes of the Big South Fork of the Cumberland River System.

FRIDAY AFTERNOON — APRIL 18

ICHTHYOLOGY AND HERPETOLOGY

Auditorium, Ellington Biological Sciences Building

Presiding: Dr. Carter R. Gilbert, University of Florida

- 2:00 95. ETNIER, DAVID A. (The University of Tennessee). Additional Notes on *Etheostoma trisella* Bailey and Richards.
- 2:15 96. GOODYEAR, C. PHILLIP (Mississippi State University). The Role of Learning in Y-axis Orientation of the Mosquitofish, *Gambusia affinis*.
- 2:30 97. BARCLAY, LEE AND WILLIAM MIKE HOWELL (Samford University). Somatic Chromosomes of the Percid Fishes, *Percina nigrofasciata* and *Etheostoma artesiae*.
- 2:40 98. AMBERG, LARRY W. (Northeast Louisiana State College). The Geographic Distribution and Variation in the Cyprinid Fish, *Notropis volucellus*, in Louisiana.
- 2:50 99. GRAY, JAMES A. (Northeast Louisiana State College). Variation in the Cyprinid Fish, *Notropis lutrensis*, from the Drainages of Louisiana and Mississippi.
- 3:05 100. DOUGLAS, NEIL H. (Northeast Louisiana State College). The Geographical Distribution of Fishes Adjacent to the Areas East and West of the Mississippi River in Louisiana and Mississippi.
- 3:20 101. GILBERT, CARTER R. (University of Florida). Comments on the Evolution of the Pharyngeal Teeth in Cyprinid Fishes.
- 3:35 102. GILBERT, CARTER R. (University of Florida). Two New Genera and Species of Western Atlantic Gobiid Fishes with Vomerine Teeth.
- 3:50 103. FINLEY, MACK T., DENZEL E. FERGUSON, AND J. LARRY LUDKE (Mississippi State University). Possible Selective Mechanisms in the Development of Insecticide-resistant Fishes.
- 4:05 104. WALL, BENJAMIN R., JR. AND JAMES D. WILLIAMS (The University of Alabama). A New Percid Fish (*Etheostoma*) from the Tennessee River System in Alabama.
- 4:15 105. RIVAS, LUIS R. (United States Fish and Wildlife Service). Geographical and Ecological Distribution of Western Atlantic Snappers of the Genus *Lutjanus*.
- 4:30 106. REED, JAMES R. (Virginia Commonwealth University). Uptake and Elimination of Radiotungsten in Black Bullheads, (*Ictalurus melas*).
- 4:45 107. MEDFORD, DENNIS W. AND BILL A. SIMCO (Memphis State University). An Investigation of the Fishes of the Wolf River in Tennessee and Mississippi.

ANIMAL ECOLOGY

Room 303 B, University Center

Presiding: Dr. C. D. Wilder, Virginia Polytechnic Institute

- 2:00 108. HARVEY, MICHAEL J. (Memphis State University) AND ROGER W. BARBOUR (University of Kentucky). Home Range of the Eastern Mole, *Scalopus aquaticus*.
- 2:13 109. GITTLESON, STEPHEN M. AND BARBARA WOODRUFF (University of Kentucky). Mass Accumulation of Microorganisms.
- 2:26 110. JOHNS, FRED L. (North Carolina State University). Winter Habitat Exploitation in Four Species of Sparrows in Ecotones.
- 2:39 111. MCGOWAN, ROBERT W. (Memphis State University). Ornithological Education in Southeastern Colleges and Universities.
- 2:52 112. BAMFORTH, STUART S. (Newcomb College of Tulane University). Influence of Vegetation on Soil Protozoa.
- 3:05 113. WALLER, WILLIAM T. AND JOHN CAIRNS, JR. (Virginia Polytechnic Institute). Changes in Movement Patterns of Fish Exposed to Sublethal Concentrations of Zinc.
- 3:18 114. SPARKS, RICHARD E., ALAN G. HEATH, AND JOHN CAIRNS, JR. (Virginia Polytechnic Institute). Some Effects of Zinc on the EKG and Breathing Signal of Bluegills (*Lepomis macrochirus* Rafinesque).
- 3:31 115. DICKSON, KENNETH L. AND JOHN CAIRNS, JR. (Virginia Polytechnic Institute). The Use of the Sequential Comparison Index as a Biological Evaluation of Stream Pollution.
- 3:44 116. BURBANCK, W. D., C. G. GOODCHILD, ELIZABETH S. DENNIS, C. E. STYRON, AND MADELINE P. BURBANCK (Emory University). Ecological Implications of Studies of α -amino Acids in Anthurid and Asellid Isopods.
- 3:57 117. SMITH, MICHAEL H. (University of Georgia). Absolute Densities of Small Mammals.
- 4:10 118. ANGELOVIC, J. W., D. E. HOSS, AND G. W. THAYER (Bureau of Commercial Fisheries Radiobiological Laboratory-Beaufort, North Carolina). Energy Requirements of Pinfish, *Lagodon rhomboides*, in the Newport River Estuary, North Carolina.
- 4:23 119. SIMMONS, GEORGE M., JR. (Virginia Commonwealth University) AND STUART E. NEFF (Virginia Polytechnic Institute). A Comparative Study of Thermal Stratification in a Mainstream and Pumped-Storage Impoundment.
- 4:36 120. PARRISH, FRED K., ROBERT M. HUIE, JR. AND JOHN J. BARNETT (Georgia State College). A Preliminary Report of Animals Found on Granite Outcrops.

PLANT ECOLOGY

Room 303 C, University Center

Presiding: Dr. Arthur Cooper, North Carolina State University

- 2:00 121. TAYLOR, FRED G. JR. AND JOHN P. WITHERSPOON (Radiation Ecology Section, Health Physics Division, Oak Ridge National Laboratory). Fallout Studies on Native Vegetation. I. Effects of Beta-Radiation (^{90}Sr) on White Pine and Red Oak Trees.
- 2:13 122. WITHERSPOON, JOHN P. AND FRED G. TAYLOR (Radiation Ecology Section, Health Physics Division, Oak Ridge National Laboratory). Fallout Studies on Native Vegetation. II. Field Retention of a Fallout Simulant by White Pine and Red Oak Trees.
- 2:26 123. COWGILL, CYTHIA AND A. RANDOLPH SHIELDS (Maryville College). Productivity and Species Diversity of Plankton, Norris Lake, Summer, 1968.
- 2:39 124. LIPPS, E. LEWIS (Shorter College) AND H. R. DESELM (University of Tennessee). Pines in the Vegetation of the Marshall Forest.
- 2:52 125. MCCORMICK, J. FRANK, FAIRMAN CUMMING, CLAIR MELLINGER AND REBECCA SHARITZ (University of North Carolina). Experimental Analysis of Community Structure.
- 3:05 126. MEIJER, WILLEM (University of Kentucky). Phyto-Geographical and Ecological Studies in Malesia.
- 3:18 127. MAGNOLI, MICHAEL A. (Marine Science Institute, University of Alabama) Concentrations of Zinc, Copper, Manganese, Molybdenum, and Boron in Plankton Samples from Selected Stations of Mobile Bay.
- 3:31 128. WILLIAMS, LOUIS G. (University of Alabama). Plankton, Detritus and Clay Turbidities in the Mobile Gulf of Mexico Interchange.
- 3:44 129. WAY, PAMELA J. AND JOE A. EDMISTEN (University of Georgia). A Profile of Fernbank Forest.
- 3:57 130. ELLIS, E. ANN AND JOE A. EDMISTEN (University of Georgia). Macroscopic Temperate Zone Epiphyllae.
- 4:10 131. BAILEY, JOHN KERMIT (Lincoln Memorial University). A Preliminary Study of the Ferns on the Limestone Bluffs of Norris Lake.
- 4:23 132. STALTER, RICHARD (High Point College) AND WADE T. BATSON (University of South Carolina). An Ecological Study of a South Carolina Salt Marsh.
- 4:36 132a. AMUNDSEN, C. A. AND E. E. C. CLEBSCH (University of Tennessee). Vegetation and Landscape Processes on Amchitka Is., Alaska.

PLANT SYSTEMATICS, FLORISTICS, AND MORPHOLOGY

Room 303 D, University Center

Presiding: Dr. A. J. Sharp, University of Tennessee

- 2:00 133. JONES, SAMUEL B., JR. (University of Georgia). Biosystematic Studies in *Ver-
nonia* (Compositae).
2:13 134. COFFEY, JANICE C. (Queens College). Chemotaxonomic Studies in the Southeastern Species of *Luzula*.
2:26 135. LIPSCOMB, HARRIETT (Georgia College at Milledgeville). A Consideration of the position of *Platyra*.
2:39 136. HUNTER, GORDON E., KIM FREEMAN, BARBARA BURCH, AND GUILLERMO FLORES (Tennessee Technological University). Flavonoids and Systematics of American *Ver-
nonia*: Compositae.
2:52 137. DRAPALIK, DONALD J. (Georgia Southern College). Corona Variation in Southeast-
ern United States *Matelea* (Asclepiadaceae).
3:05 138. BROWNE, E. T., JR. (Memphis State University). Some Systematic Observations on *Hymenocallis* Salisb. (Amaryllidaceae) in the Southeastern United States.
3:18 139. NESOM, GUY L. (University of North Carolina — Chapel Hill). Apomictic Species and Species Complexes in Southwestern United States *Erigeron* section *Olygotrichium* (Asteraceae).
3:31 140. SHETLER, STANWYN G. (Smithsonian Institution). The Crisis of Herbaria.
3:44 141. RADFORD, ALBERT E. (University of North Carolina). Progress Report on Southeastern Flora.

EXPERIMENTAL BOTANY

Room 303 E, University Center

Presiding: Dr. J. T. Mullins, University of Florida

- 2:00 142. CULPEPPER, J. T. AND IOLA T. MCCLURKIN (University of Mississippi). Demonstration of a Potassium-Sensitive, Calcium-Activated Adenosine Triphosphatase in the Meristematic Cells of Loblolly Pine.
2:13 143. HARRIS, W. F. (Oak Ridge National Laboratory). The Effect of Fast Neutron Radiation and Light Intensity on Root-Shoot Ratios of *Liriodendron tulipifera* L. Seedlings.
2:26 144. RAJ, BALDEV AND J. M. HERR, JR. (University of South Carolina). The Isolation of Protoplasts from the Placental Cells of *Solanum nigrum* L.
2:39 145. SABHARWAL, P. S. (University of Kentucky). In Vitro Culture of Ovules, Nucelli and Embryos of *Citrus*.
2:52 146. YOW, M. E., AND B. H. WISE (Memphis State University). Pasteur Effect in the Corn Seedling (*Zea mays* L.).
3:05 147. AMEN, RALPH D. (Wake Forest University). Seed Germination Responses of the Salt Marsh Grass *Distichlis spicata*: Mechanism of Seed Dormancy. (Angiospermae: Poales: Poaceae).
3:18 148. PARRISH, DAVID J. (Wake Forest University). Seed Germination Studies of Horse Nettle, *Solanum carolinense* L.
3:31 149. SEHGAL, PREM P. AND JAMES A. COOK (East Carolina University). Regulation of Urease in Cotyledons.
3:44 150. CARTER, JR., GEORGE E. AND RICHARD J. KELLY (Wake Forest University). Seed Germination Responses from the Salt Marsh Grass *Distichlis spicata* (L.) Green, (Angiospermae, Poales, Poaceae): Ecological Aspects.
3:57 151. MANSURI, A. D., D. B. BIBB, AND D. J. KELLY (Bennett College). Radiation Effect on Starch Metabolism in Wheat Seedlings.
4:10 152. ALLEN, MABEL L. AND JOHNNY JACKSON (Savannah State College). Effects of the Iodide Ion on Abscission in Bean (*Phaseolus vulgaris* var Tendergreen) Leaf Explants.
4:23 153. BALLAL, S. K. AND H. K. MEREDITH, (Tennessee Technological University). Growth Response of Tomato Seedlings to a-Napthalenaecetic acid.
4:36 154. STEVENSON, ENOLA L. (Atlanta University). Growth and Nitrogen Metabolism of Plants under Continuous Light of Different Qualities and Intensities.

GENETICS

Room 303 F, University Center

Presiding: Dr. W. Donald Fattig, University of Alabama

- 2:00 155. JINK, WILLARD L. (Marshall University). The Reproductive Potential of *Drosophila affinis*.
2:13 156. MURRAY, JAMES (University of Virginia) and BRYAN CLARKE (University of Edinburgh). The Inheritance of Sinistrality in *Partula suturalis* (Gastropoda, Stylommatophora).
2:26 157. RAY, JAMES H. AND JOHN M. CARPENTER (University of Kentucky). The Effect of Zinc-65 on the Production of Lethal Genes in *Drosophila melanogaster*.
2:39 158. HESS, LLOYD W. (Savannah River Ecology Laboratory) and DAVID B. DUNN (University of Missouri). Isolating Mechanisms in the *Lupinus argenteus* Complex.

- 2:52 159. STEPHENS, RALPH E. AND GORDON J. CARLSON (The University of Tennessee). The Analysis of Tritiated Thymidine Incorporation in Grasshopper Neuroblasts.
- 3:05 160. AMAND, W. ST. (University of Mississippi). A Model System for Population Genetics Experiments.
- 3:18 161. BIGGERS, CHARLES J. (University of South Carolina), Serum Transferrin Polymorphism in *Peromyscus polionotus*.
- 3:31 162. MOISAND, ROBERT E. and JOHN M. CARPENTER (State University College at Buffalo, University of Kentucky). Effect of Continuous Exposure to Two Insecticides on the Fitness of Two Third Chromosome Inversions of *Drosophila pseudoobscura*.
- 3:44 163. HARRIS, JOHN W. (Tennessee Technological University), Isozymes of the E₄ Esterase in *Zea mays*.
- 3:57 164. FINDLEY, DAVID L. AND PATRICIA L. WALNE (University of Tennessee). Effects of Light and Temperature on the Ultrastructure of Stage IV Cells of *Chlorogloea fritschii* (Cyanophyceae, Chroococcales).
- 4:10 165. DEASON, T. R., W. H. DARDEN JR. AND SARAH ELY (University of Alabama). Ultrastructure of Mitosis in *Volvox aureus*.
- 4:23 166. FETNER, ROBERT H. (Georgia Institute of Technology). Observations on Chinese Hamster (*Cricetulus griseus*) Metaphase Chromosomes with the Scanning Electron Microscope.

ANIMAL PHYSIOLOGY AND EXPERIMENTAL ZOOLOGY

Room 303 G, University Center

Presiding: Dr. W. W. Gibson, LeMoyne College

- 2:00 167. EDWARDS, KIAH, JR. AND ROY HUNTER, JR. (Atlanta University). The Chemical Characterization of the Notochordal Sheath in Bullfrog Larvae.
- 2:13 168. BURNHAM, KENNETH D. (The University of Tennessee). Experiments with Embryos of *Ascaris lumbricoides* var. *suum* in vacuo.
- 2:26 169. MCCLURKIN, IOLA T. AND ROBERT D. RIETHER (The University of Mississippi). Rapid Histological Preparation of Chitinous Specimens.
- 2:39 170. BELL, RONALD E. (Millsaps College), E. LESLIE KNIGHT (Wingate College), and ALFRED E. PERRY (Memphis State University). Electrophoretic Patterns of the Serum Proteins of Salamanders of the Genus *Gyrinophilus*.
- 2:52 171. LASLIE, WAYNE (Georgia State College). The Effects of Alkyl Benzene Sulfonate (ABS) and Linear Alkylate Sulfonate (LAS) at Three Concentrations on the Respiration Rate of *Notropis lutipinnis* Jordan and Brayton.
- 3:05 172. FORRESTER, DONALD J. (Clemson University). Reproductive Performance of a Laboratory Colony of Deermice, *Peromyscus maniculatus*.
- 3:18 173. CUNNINGHAM, JAMES R. (Clemson University). The Effects of X-radiation on the Blood Picture of Mice Infected with *Heligmosomum skrjabini* (Nematoda: Heligmosomidae).
- 3:31 174. SMOAKE, J. ALVIN AND SAMUEL R. TIPTON (University of Tennessee). Hormonal Changes in Rats Cross-adapted to Cold Environments and Simulated High Altitude.
- 3:44 175. CASCIO, NICHOLAS J. LO (State University College at Buffalo). A Study of Multiple Molecular Forms of Enzymes in Species of Salmonidae and Esocidae: (Osteichthyes: Clupeiformes).
- 3:57 176. STIDHAM, JAMES D. AND CHARLES E. LANE (Presbyterian College and Institute of Marine Sciences, University of Miami). The Effects of Salinity on Blood Free Amino Acids in the Land Crab, *Cardisoma guanhumi* (Crustacea: Decapoda: Gecarcinidae).
- 4:10 177. CAPONE, J. J. AND R. W. HULL (Florida State University). Thymidine Phosphorylase Activity in Chicken Erythrocytes Infected with Avian Malaria, *Plasmodium lophurae*.
- 4:23 177a. HUBERT, C. E. (Clark College). Dissociation, Inflammation, and Regeneration Phenomena in Livers of Chick Embryos Treated with Aminoguanidine Sulfate.

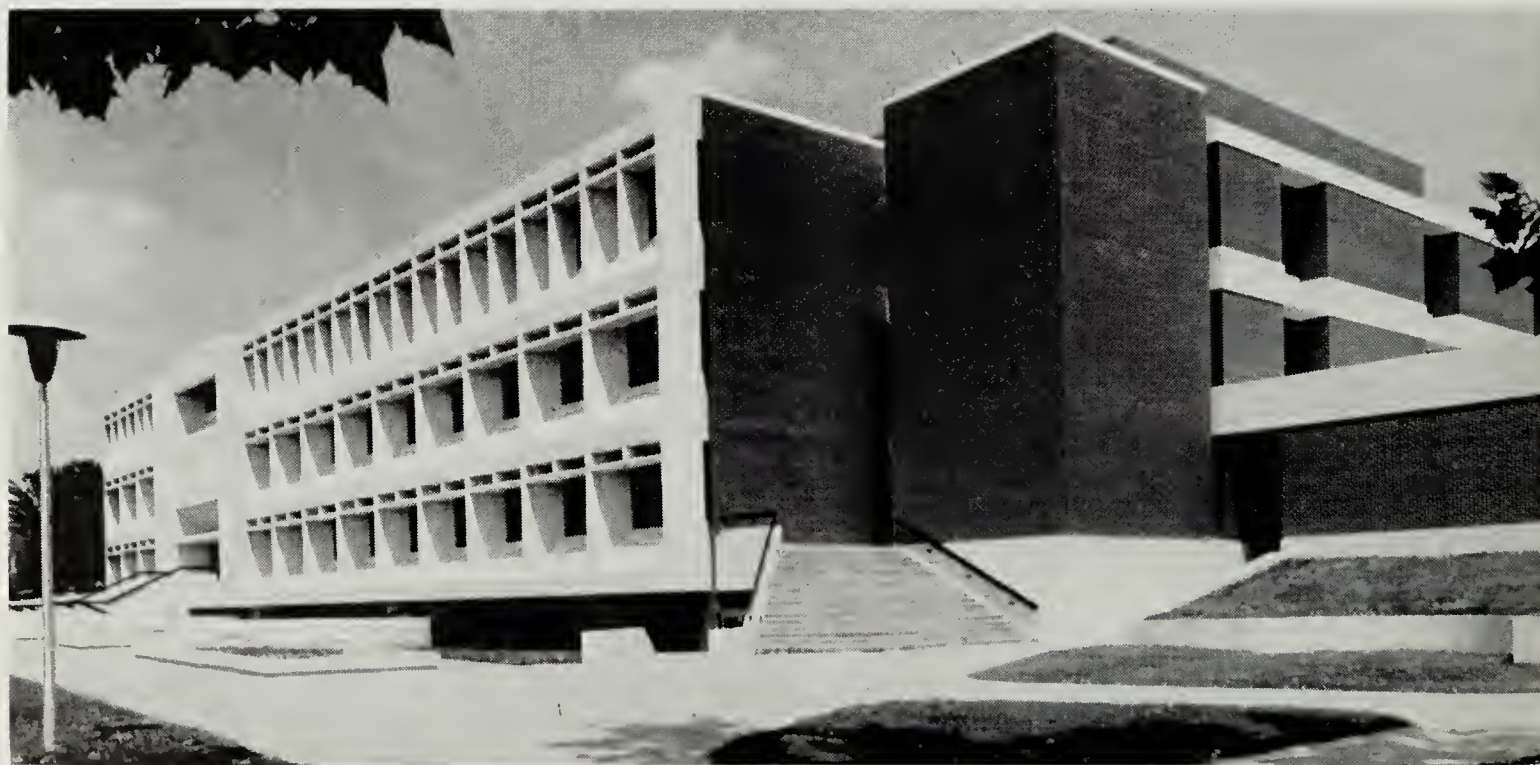
PARASITOLOGY AND HISTOLOGY

Room 303 H, University Center

Presiding: Dr. Elon E. Byrd, University of Georgia

- 2:00 178. BUCKELEW, THOMAS P. AND FELIX H. LAUTER (University of South Carolina). A Preliminary Study of the Miracidium of *Diplodiscus temperatus*. (Stafford, 1905).
- 2:13 179. OLEXIK, WILLIAM A., A. E. PERRY, AND W. E. WILHELM (Memphis State University). Parasites of the Tree Squirrels of Southwest Tennessee.
- 2:26 180. FORRESTER, DONALD J. (Clemson University). Influence of Weather on the Intensity of Infection of Bighorn Sheep with Lungworms of the Genus *Protostrongylus* (Nematoda: Protostrongylidae).
- 2:39 181. BEST, STEPHEN H. (Clemson University). A Comparison of the Helminth Faunas of Two Populations of Cotton Rats, *Sigmodon hispidus*, from South Carolina.

- 2:52 182. HAIR, JAY D. (Clemson University). Geographical Distribution and Seasonal Incidence in the Helminth Parasites of the Starling, *Sturnus vulgaris* L. (Aves; Passeriformes; Sturnidae).
- 3:05 183. GOODCHILD, C. G. (Emory University) and VIRGINIA L. MARTIN (Queens College). A Study of the Validity of Certain *Spirorchis* Species.
- 3:18 184. JOHNSON, CHARLES A. (North Carolina State University). *Myxidium chelonarum* n. sp. (Cnidosporidia: Myxosporida: Myxidiidae) from Various North American Turtles.
- 3:31 185. MILLER, GROVER C. AND REINARD HARKEMA (North Carolina State University). Helminths of the Opossum (*Didelphis virginiana*).
- 3:44 186. DOBBS, H. DONALD (Wofford College). Simple Method of Preparing Intestinal Tracts of Mice for the Purpose of Studying Adult *Trichinella spiralis* in situ.
- 3:57 187. CUNNINGHAM, FROST H. (North Carolina State University). A Survey of the Helminths of Aquatic Turtles in North Carolina.
- 4:10 188. ALLEN, W. R. III AND REINARD HARKEMA (North Carolina State University). Esterase Activity in *Pharyngostomoides* sp. (Trematoda: Strigeida: Diplostomatidae).
- 4:23 189. SHANNON, W. ALLEN AND B. J. BOGITSH (Vanderbilt University). Light and Electron Microscope Radioautographic Studies of Galactose-H³ Utilization Related to Mucopolysaccharide Synthesis in *Megalodiscus temperatus*.
- 4:36 190. BOGITSH, BURTON J. (Vanderbilt University). Fine Structural Localization of Acid Phosphatase and Aryl Sulfatase Activities in the Intermediate Layer of *Hymenolepis diminuta* cysticercoids.
- 4:49 191. REID, WILLIS A., JR. AND REINARD HARKEMA (North Carolina State University). Esterases of *Procyotrema marsupiformis* Harkema and Miller, 1959 (Trematoda: Strigeida: Diplostomatidae).
- 5:02 192. PRESTWOOD, KATHERINE AND ELON E. BRYD (University of Georgia). *Psilostoma* sp. from the Wild Turkey.



UNIVERSITY CENTER — Memphis State University

University of Virginia Announces Mountain Lake Program

The University of Virginia has announced the program of graduate biology courses to be offered this summer at the Mountain Lake Biological Station in southwestern Virginia. They are as follows.

First Term — June 12 through July 15

Entomology: Dr. George W. Byers, University of Kansas

Ornithology: Dr. David W. Johnston, University of Florida

Plant Ecology: Dr. Frank McCormick, University of North Carolina

Vertebrate Endocrinology: Dr. B. E. Frye, University of Michigan

Second Term — July 17 through August 21

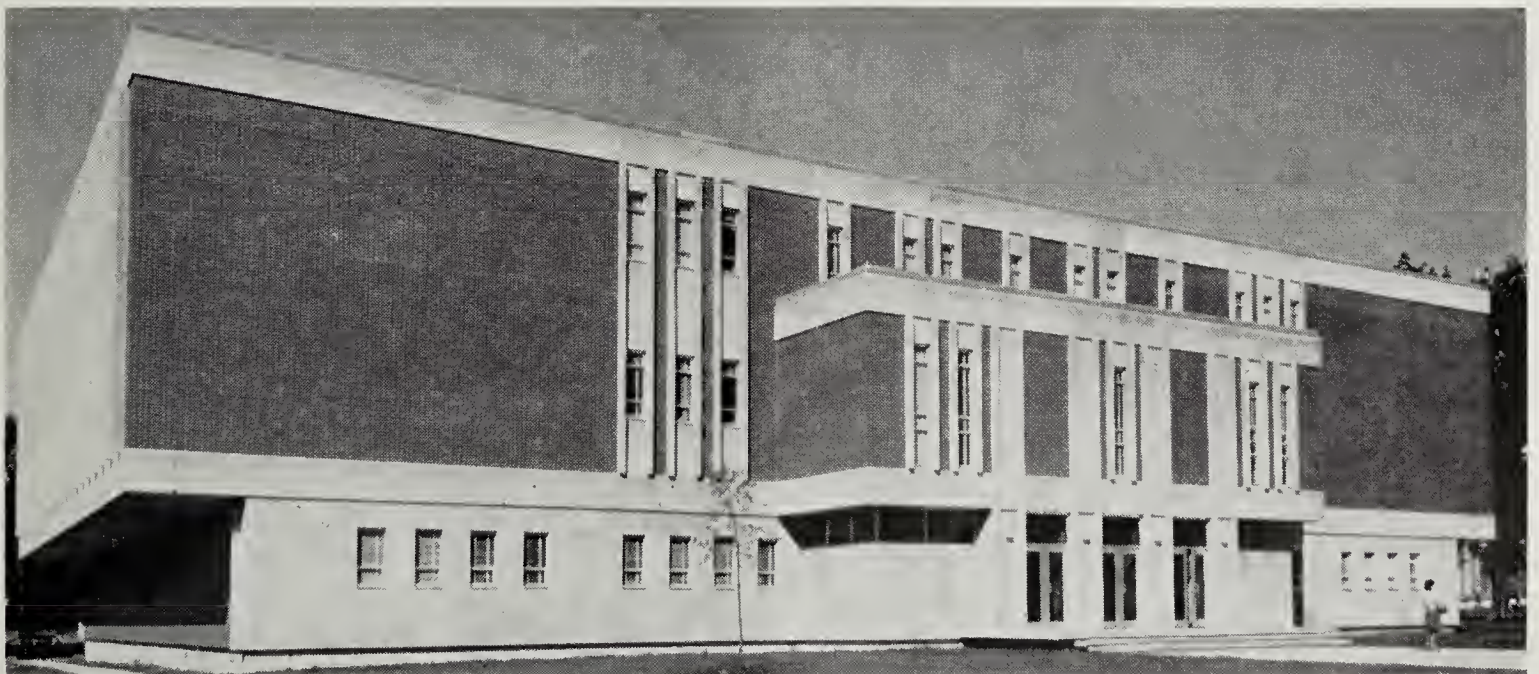
General Ecology: Dr. Maurice Brooks, West Virginia University

Invertebrate Zoology: Dr. Horton H. Hobbs, Jr., Smithsonian Institution

Mycology: Dr. Constantine J. Alexopoulos, University of Texas

Plant Biosystematics: Dr. C. Ritchie Bell, University of North Carolina

A limited number of National Science Foundation scholarships are available for research and study: (1) Post-doctorate for research, stipend \$1300; (2) Pre-doctorate for supervised research, stipend \$500; and (3) Post-graduate for training in field biology, stipend \$400. Preference is given for studies concerned with the biota of the region. Application blanks for these awards may be secured from the Director, Mountain Lake Biological Station, Department of Biology, University of Virginia, Charlottesville, Virginia 22903 and must be submitted before May 1, 1969.



ELLINGTON BIOLOGICAL SCIENCES BLDG. — Memphis State University

Abstracts of Papers Presented at the 30th Annual Meeting of the Association of Southeastern Biologists

The number in parenthesis at the top of each abstract refers to the number of that paper in the program.

(37)

The Effect of Fluoride on *Chlamydomonas reinhardtii*. (Chlorophyceae: Volvocales)

STUART W. AKERS AND CHARLES E. ANDERSON,
North Carolina State University

Fluoride concentrations, from 10^{-1} M to 10^{-2} M, were found to produce a limiting effect upon asexual reproduction in *Chlamydomonas reinhardtii* in short term experiments. Within this concentration range, fluoride induced morphological changes also. Test made on culture treatments at 10^{-2} M fluoride indicated an increased amount of amino acid assimilation after prolonged exposure of the cells to fluoride.

(152)

Effects of the Iodide Ion on Abscission in Bean (*Phaseolus Vulgaris* Var Tendergreen) Leaf Explants

MABEL L. ALLEN AND JOHNNY JACKSON
Savannah State College

The abscission region, which included 3 mm of pulvinus tissue and 10 mm of rachis tissue, was excised from the terminal leaflet of the first trifoliate leaf of 23 to 27 day old bean plants. The proximal and distal ends of separate explants were exposed to different levels of potassium iodide ($1.0, 2.0, 3.0, 4.0, 5.0 \times 10^{-4}$ M) incorporated into plain agar blocks, agar blocks containing a promotive level of IAA (200 mg/l), or agar blocks containing an inhibitory level of IAA (500 mg/l). The results showed that the iodide ion retarded substantially the formation of the abscission zone. This was more pronounced among explants treated with the higher concentration of potassium iodide. The two concentrations of IAA had little, if any, influence in altering the action of iodine ion. Explants treated with potassium iodide at different positions (proximal, distal, proximal and distal) did not vary significantly in the rate or percentage of abscission.

(188)

Esterase Activity in *Pharyngostomoides* sp. (Trematoda: Strigeida: Diplostomatidae)

W. R. ALLEN, III AND REINARD HARKAMA
North Carolina State University

Pharyngostomoides sp., a trematode found in the small intestine of the raccoon, was studied histochemically for esterase activity. Fresh frozen material or specimens prefixed in 10% buffered formalin were sectioned at 10μ in a Lab Tek cryostat. Substrates employed with appropriate inhibitors were: 5-bromoindoxyl acetate,

naphthal AS-D acetate, acetylthiocholine iodine, butyrylthiocholine iodine, and alphanaphthyl acetate. Localization of esterases was demonstrated in the oral sucker, acetabulum, pharynx, holdfast organ, pseudosuckers and underlying glandular area, anterior fore-body cuticle and the associated subcuticular tissue, nerve tissue, vas deferens, and bursa.

(147)

Seed Germination Responses of the Salt Marsh Grass *Distichlis spicata*: Mechanism of Seed Dormancy. (Angiospermae: Poales: Poaceae)

RALPH D. AMEN, Wake Forest University

At maturity, the seeds (caryopses) of *Distichlis spicata* (L.). Green are dormant. This condition of dormancy appears to be due to an imbalance of growth hormones favoring inhibitors, and appears to be related to the condition of the "seed coat" (pericarp). Data are presented on the effects of various promoters (GA, NO_3 , thiourea) and inhibitors (ABA, CCC, coumarin) on dormancy and germination as related to aqueous leaching and scarification of the seeds.

The postulated mechanism of seed dormancy is that endogenous growth inhibitors accumulate during seed maturation and restrict hydrolytic enzyme activity in the endosperm. The subsequent decay or removal of the inhibitor(s) facilitates the hormonal promotion of embryonic growth (germination). It is strongly suspected that there is a correlation between those habitat factors which lead to the induction of seed dormancy and those conditions which favor the natural breaking of dormancy.

(132a)*

(118)

Energy Requirements of Pinfish, *Lagodon rhomboides*, in the Newport River Estuary, N. C.

J. W. ANGELOVIC, D. E. HOSS, AND G. W. THAYER
Bureau of Commercial Fisheries
Radiobiological Laboratory
Beaufort, North Carolina 28516

Minimum energy requirements for pinfish in the Newport River (area 30 km^2) were calculated from estimates of population number and size composition plus measurements of respiration rates and caloric values. A mark-and-recapture study in the fall gave a length-frequency distribution and a population estimate of 1.6×10^6 pinfish. Measurements of respiration rates of pinfish ranging in weight from .01 to 240.00 grams were used to derive the regression equation.

Standard Metabolic Rate = $.303 \text{ Weight}^{.752}$

* See page 73.

Micro-bomb calorimetry was used to obtain a value of 4.665 cal/mg dry weight for pinfish. Based on these data, the pinfish population had an energy content of 47.6×10^9 cal and, in addition, respired a minimum of 461×10^6 cal/day. In the estuary, the net production of phytoplankton during the fall averaged 15.6×10^9 mg C/day. If the phytoplankton represented one-third of the total primary production and pinfish were secondary consumers in a food chain with transfer efficiencies of 10%, the pinfish population required 8.7% of the total primary production for basic maintenance.

(The Radiobiological Laboratory is supported jointly by the Bureau of Commercial Fisheries and the Atomic Energy Commission.)

(74)

Collection and Characterization of the Venom of *Loxosceles reclusus* (Arachnida)

ARTHUR L. APPLIGATE

The freeze-dried venom from three spiders was serially diluted with distilled water to make up three concentrations of venom (1:20, 1:50 and 1:100). After 0.1 ml. of each dilution had been injected into the ear of a single rabbit, three hemorrhagic lesions, which corresponded in size to the concentrations of venom, were formed at the sites of the injection. To further characterize the venom by its pathogenicity, three *Loxosceles* females were induced to envenomate the shaved flanks of three New Zealand White rabbits. The resulting erythema, intravascular hemolysis, and hemorrhagic lesion formation in the area of external oblique muscle of the rabbits was comparable to the pathogenesis of the *Loxosceles* envenomations described by Denny, et.al., (1964).

The *Loxosceles* venom was also characterized by the electrophoretic mobility of the proteins contained in the venom. The freeze-dried venom from twenty spiders was pooled and electrophoresed on polyacrylamide gel (7%) buffered to a pH range of 8.2-8.4. Six separate trials were made at 21°C using a constant current of 5 ma on each of the six polyacrylamide gel columns used for each trial. At least one of the gel columns from each trial was loaded with either freeze-dried hemolymph or abdominal homogenate; these columns served as controls. The venom proteins separated into eight distinct bands. The hemolymph proteins formed thirteen bands; seven of the hemolymph bands were similar in their electrophoretic mobilities to seven of the venom bands. The nine bands of proteins formed from the abdomen homogenates were dissimilar to both venom and hemolymph proteins.

(131)

A Preliminary Study of the Ferns on the Limestone Bluffs of Norris Lake

JOHN KERMIT BAILEY, *Lincoln Memorial University*

The shore lines of Norris Lake presents an abundance of unusual microclimates. This preliminary study of a limited area of this shore line reports fifteen species and/or varieties of ferns. Seven of these are reported for the first time in Campbell and Union counties in Tennessee. The adaptability of ferns to a variety of habitats (altitudes, temperatures, pH ranges, etc.) has led to some unusual traits, e.g., natural hybridizations between genera and species, with some of the hybrids

producing viable spores, and an array of morphological variations within species. Two genera, *Asplenium* and *Camptosorus*, are abundant in the area and are outstanding in these traits. The xerophytic, mesophytic and hydrophytic nature of various fern species is well demonstrated in the area.

(153)

Growth Response of Tomato Seedlings to α -Naphthaleneacetic acid.

S. K. BALLAL AND H. K. MEREDITH
Tennessee Technological University

Tomato seeds (Marglobe variety) soaked for six hours prior to planting in various concentrations of α -Naphthaleneacetic acid (NAA) ranging from 500 ppm to 2800 ppm, and the growth response was studied for four weeks under 12-hr. photoperiods. The inhibition of growth rate increased proportionately from 25% at 500 ppm to 75% at 1600 ppm. However, at concentrations above 1600 ppm the inhibition was approximately 50%. Shoot tip applications containing 100 ppm and 500 ppm of NAA were made to plants at 12, 18 and 24 days of age. Although only 15% growth inhibition occurred at both the concentrations, there was evidence of resistance to exogenous NAA increasing with age of plants. Plants responded to NAA application in the form of absence of shoot apex, pronounced swellings on the axis, and thickening of the stem, and petioles. The extent of hypertrophy was in direct proportion to the concentration of NAA, and the response of plants was independent of age at the time of application.

(112)

Influence of Vegetation on Soil Protozoa

STUART S. BAMFORTH
Newcomb College of Tulane University

Vegetation influences the numbers and proportions of ciliates and testacea. In coniferous forests, where organic materials accumulate in the litter, slow-growing testacea are 10 times more abundant than ciliates and number up to 36,000/g (wet weight) in litters and up to 6,000/g in soils. In deciduous forests and grasslands, where decomposition rate keeps pace with organic production, testacea decrease to 200-7000/g in both horizons, and bacteria-dependent ciliates increase to 500-5000/g in litters, while remaining about the same (less than 300/g) in soils.

(4)

Germination Requirements of *Cyperus Inflexus*

CAROL C. BASKIN AND JERRY M. BASKIN
University of Kentucky

Seeds of the annual sedge, *Cyperus inflexus* Muhl. (Cyperaceae), were dormant at maturity. Dormancy in this species was overcome by stratification (5°C), by scarification, and to a lesser extent by after-ripening in dry storage. Stratified seeds germinated better (1) at daily alternating temperatures (28° to 18°C) than at constant temperatures (28° or 18°C) and (2) in a 12-hour photoperiod than in constant darkness. Non-stratified seeds that were mechanically scarified at the radicle end or acid scarified germinated well at (1) a constant temperature of 28° or 18°C in 12-hour photoperiod and (2) an alternating temperature of 28° to 18°C in both light and dark. These germination requirements will be related to the ecology of this species.

(3)

Amino Acids and Amides in Diffusate of *Psoralea Subacaulis* Seeds

JERRY M. BASKIN, *University of Kentucky*

Scarified seeds of *Psoralea subacaulis* T. & G. (Leguminosae) were soaked in distilled water for 24 hours at 25°C. Water containing diffusate of the seeds was analyzed for amino acids and amides. Identification of amino acids and amides was made by comparison of R_f values, patterns and colors of known substances. Quantitative determinations were made by comparing their absorbance (570 millimicrons) with standard curves. Seventeen amino acids and two amides including alanine, arginine, asparagine, aspartic acid, one-half cystine, gamma-amino-n-butyric acid, glutamic acid, glutamine, glycine, histidine, isoleucine, leucine, lysine, phenylalanine, proline, serine, threonine, tyrosine, and valine were identified. One-half cystine, gamma-amino-n-butyric acid, alanine and glutamic acid were the most abundant.

The importance of seed diffusates in stimulating germination and growth of soil microorganisms, as described in the literature, is discussed.

(30)

Variation and Selection Pressure in *Aquilegia caerulea* James (Ranunculaceae)

C. RITCHIE BELL, *University of North Carolina*

Although the flowers of *Aquilegia* represent a relatively high degree of floral specialization for a member of the Ranunculaceae, most species are not morphologically stable; there is considerable floral and vegetative variability both within and between species. Some of the observed variability can be attributed to phenotypic response to varied environmental factors and some to hybridization and introgression. However, other aspects of the intraspecific variation pattern may be the result of retrogression because of relaxed pollinator selection pressure on the evolved floral characters.

(62)

Serum Protein Alterations in Hormonally Induced Polyarteritis Nodosa as Revealed by Electrophoresis

RONDAL E. BELL, *Millsaps College*

Polyarteritis nodosa was induced into adult, male, Sprague-Dawley rats by administering subcutaneous injections of estradiol propionate for thirty days followed by injections of follicle stimulating hormone for another thirty days. As early as four months and up to twelve months after cessation of treatment, sixty to eighty per cent of the animals develop the disease. The disease follows the pattern of a chain reaction involving hyperplasia of the pituitary, adenomatous adrenals, hyaline casts in the kidney tubules, changes in the concentrations of serum electrolytes, and finally the typical polyarteritic response in arterioles and arteries in many areas. Serum protein electrophoresis on cellulose polyacetate revealed an increase in the total serum protein during the development of the disease with accompanying decrease in serum albumin and increase in globulin fractions, especially the alphaone globulin fraction.

(79)

A Systematic Study of Planarian Species Utilizing Cellulose Polyacetate Electrophoresis

RONDAL E. BELL, *Millsaps College*

AND

C. JULIAN GRUBBS, *University of Tennessee Medical Center*

The electrophoretic separation of soluble proteins extracted from four species representing three genera of planarians revealed distinct species variations in electrophoretic mobilities, number of components, relative amounts and resolution of fractions. Extracts of *Dugesia tigrina*, *D. dorotocephala*, *Cura foremanii* and *Phagocata gracilis gracilis* were prepared by a freeze-thaw method. The relative protein fractions were obtained with the Gelman deluxe electrophoresis chamber using cellulose polyacetate as the supporting medium. Veronal buffer of pH 8.8 (ionic strength 0.05) was used. Ten lambda aliquots of sample were electrophoresed for 60 minutes at 255 volts. The relative concentrations of the separated fractions were obtained from the stained electrophorograms with a recording densitometer. The electrophoretic patterns are characteristic and reproducible for each of the species investigated. Attempts were made to correlate morphological characters with the protein patterns. In general, similarities of the patterns tend to verify existing taxonomic relationships.

(170)

Electrophoretic Patterns of the Serum Proteins of Salamanders of the Genus *Gyrinophilus*

RONDAL E. BELL, *Millsaps College*

E. LESLIE KNIGHT, *Wingate College*

AND

ALFRED E. PERRY, *Memphis State University*

Two species presently are recognized within the genus *Gyrinophilus*. One species, *G. pallescens*, appears to be restricted to caves within its geographical distribution, while the other, *G. porphyriticus*, typically a stream or spring dweller, also is encountered in caves. *G. pallescens* is a neotenic form, while *G. porphyriticus* normally metamorphoses into the adult stage. Zone electrophoresis on cellulose polyacetate was used to characterize the serum proteins of the species of *Gyrinophilus*.

The total protein of both species separated into five electrophoretic fractions. Significant differences were observed between the two species with respect to electrophoretic mobilities, relative amounts and resolution of fractions. Electrophorograms indicated a significant increase of serum protein occurring in the transformation from the larval to adult stage in *G. porphyriticus*. The electrophoretic distributions and relative concentrations of the protein fractions of the larval stage of *G. porphyriticus* resemble *G. pallescens* more closely than the adult stage of *G. porphyriticus*.

(181)

A Comparison of the Helminth Faunas of Two Populations of Cotton Rats, *Sigmodon hispidus*, from South Carolina

STEPHEN H. BEST, *Clemson University*

A survey of the helminth parasites of *Sigmodon hispidus* from the Piedmont and Coastal Plain regions of

South Carolina was conducted during 1968 and 1969. Nematodes and cestodes were the predominant helminths. Comparative data on the numbers of species and their incidence were obtained and related to the ecological differences that were observed between the two areas. New locality records for cotton rat helminths in South Carolina were noted.

The life cycle and host range of a strain of gastro-intestinal nematode, *Longistriata adunca*, obtained from a cotton rat from the Coastal Plain region was studied experimentally.

(161)

Serum Transferrin Polymorphism in *Peromyscus polionotus*

CHARLES J. BIGGERS, *University of South Carolina*

Polymorphic serum transferrins of *Peromyscus polionotus* from South Carolina separated by polyacrylamide gel electrophoresis were shown to consist of three electrophoretic components. The three components were shown to have transferrin activity by the Ornstein procedure. A system of inheritance of three autosomal co-dominant alleles was proposed from analysis of data obtained from laboratory matings and from partial family data obtained from field collections. A comparison of three transferrin components of *P. polionotus* to that of *P. maniculatus* Trf-a, Trf-b, and Trf-c components indicated that the two species which interbreed in the laboratory share a common band (Trf-c). The three transferrin alleles of *P. polionotus* have been designated as Trf^c, Trf^d, and Trf^e. Disturbed segregation ratios of one of the alleles (Trf^d) was indicated to be due to transmission reduction.

(190)

Fine Structural Localization of Acid Phosphatase and Aryl Sulfatase Activities in the Intermediate Layer of *Hymenolepis diminuta* cysticercoids

BURTON J. BOGITSH, *Vanderbilt University*

The fine structure and the cytochemical distribution of acid phosphatase and aryl sulfatase in the intermediate cell layer of cysticercoids of *Hymenolepis diminuta* is reported. The cells comprising this layer are of two types in the developing cysticercoid and of a single type in the mature cysticercoid. In the former stage, one cell type is responsible for the elaboration of the peripheral layer with its radiating fibers. The second type is responsible for the formation of the circular fibers and, in part, the fibers of the intermediate layer. The latter type cell displays acid phosphatase and aryl sulfatase activity. Much of the activity is cytoplasmic in distribution and possibly is responsible for the ultimate degeneration of the cell. (Supported, in part, by N.I.H. grant No. AI-0858).

(5)

Capability of Nitrogen Fixation by the Coralloid Roots of *Zamia floridana*

MARGARET A. BOULWARE AND JOE A. EDMISTEN
University of Georgia

The coralloid roots of certain Australian cycads have been reported to contain endophytic blue-green algae.

Bergersen, Kennedy and Wittmann (1965) confirmed nitrogen fixation by blue-green algae in the coralloid roots of *Macrozamia communis* by the ¹⁵N₂ method. Coralloid roots of *Zamia floridana* were tested for the capability of nitrogen fixation by a modification of the acetylene reduction technique (Stewart, Fitzgerald, and Burris, 1967). Results indicated the capability of nitrogen fixation by the coralloid roots of *Z. floridana*. Slides of plant materials, technique, and results will be shown. The value of the acetylene reduction test for nitrogen fixing ability will be discussed.

(55)

Some Ultrastructural Aspects of Sperm-egg Interactions in the Horseshoe Crab, *Limulus polyphemus* (Merostomata: Xiphosura)

GEORGE GORDON BROWN, *Iowa State University and Virginia Institute of Marine Science*

AND

ROSS L. SHOGER, *Carleton College*

The *Limulus* sperm possesses four typical sperm components, acrosome, nucleus, mitochondria, and flagellum. The acrosome consist of two major parts, a hemispherical apical cap and a multifibrillar axial rod extending posteriorly from the cap caudal side through an intranuclear canal and coiling around the posterior portion of the nucleus. Andre (1963) has demonstrated the anterior projection of this rod (50μ) length during the acrosome reaction. The egg (1.5mm) is covered by two layers, an outer basement lamina (2μ thick) and an inner vitelline envelope (40-42μ thick). Examination of inseminated eggs revealed numerous spermatozoa attached to the basement lamina. Each sperm attaches by means of the acrosomal cap and its contents. The sperm axial rod projects through the two layers and presumably to the egg plasma membrane. A secondary stage involves the flagellar microtubules coiling around the nucleus and beneath the sperm plasma membrane. The mechanisms involved, mechanical or chemical, are speculative. Sperm nucleus penetration into egg has not been observed. (This work was initiated at the Marine Biological Laboratory, Woods Hole, NIH Grant TI HD - 26 - 06, and supported by NSF Grant GY4092, Virginia Institute of Marine Science, and by a small research grant fund, Iowa State University.)

(138)

Some Systematic Observations on *Hymenocallis* Salisb. (Amaryllidaceae) in the Southeastern United States

E. T. BROWNE, JR., *Memphis State University*

As envisaged by the late J. K. Small (*Manual of the Southeastern Flora*, 1933) *Hymenocallis* in the southeastern United States consists of eleven species, six of which he described himself. Subsequently, Traub and Hayward and others have proposed other binomials for taxa in the genus with the result that speciation in the genus is in a very confused state. From this study has come some clarification which may be of help to those trying to identify species in the group. As in the case of the Louisiana *Iris* species problem unraveled by H. P. Riley's brilliant work, Small and the others have apparently taken characters for species delimitation which are (1) inconstant or (2) are within the range of normal variation found within most species. Unlike the *Iris* sit-

uation, however, hybridization does not seem to have played too large a role. Considerable revision of the number of species in the genus would seem to be indicated.

(178)

A Preliminary Study of the Miracidium of *Diplodiscus temperatus* (Stafford, 1905)

THOMAS P. BUCKELEW AND FELIX H. LAUTER
University of South Carolina

The morphology of *Diplodiscus temperatus* was studied at the optical level. All facets of the morphology were reviewed including epidermal plates, subepithelium, apical gland, apical papilla, excretory system, nervous system, penetration glands, and germ ball. Stain techniques used were: Hematoxylin and Eosin, Heidenhain's Iron-Hematoxylin, and Protein Silver. Vital stains such as Neutral Red, Methylene Blue, and Nile Blue Sulfate revealed interesting detail. The miracidium was impregnated with silver nitrate in order to reveal the epidermal plate arrangement. The excretory system of the living miracidium was studied with the phase contrast microscope. This review of the morphology at the optical level presented the groundwork for a study of the ultrastructure of the miracidium.

(9)

Loblolly Pine (*Pinus taeda* L.) as an Invader of Granite Outcrop Island Communities

MADELINE P. BURBANCK, *Emory University*

After eleven years, eight .75-1.2m pine seedlings have become 6-7.5m trees in an island community at Mount Arabia. The 25 sq m area of the community has not changed since 1957 but the maximum soil depth increased from 30 to 41 cm. *Andropogon virginicus* which occupied 2/3 of the area of the community in 1957 has been replaced by pine trees with a ground cover of pine straw through which emerge a few stunted specimens of *Smilax*, *Parthenocissus*, *Quercus* seedlings, and small clumps of *Carex communis*. In 1957 there were pine seedlings (1 yr or older) in 5 out of 10 island communities with maximum measured soil depths of 30-50 cm. In 1968 there were pines in 7 of these 10 communities and in 3 additional communities where soil depth had increased during the 11 yr interval. Severe environmental conditions, particularly drought, prevent many pine seedlings from reaching maturity, but this 11-yr study suggests that *Pinus taeda* can invade island communities and become a dominant plant of the herb-shrub seral stage. (Supported in part by N.S.F. Grant GB-6881.)

(116)

Ecological Implications of Studies of χ -amino Acids in Anthurid and Asellid Isopods

W. D. BURBANK, C. G. GOODCHILD,
ELIZABETH S. DENNIS, C. E. STYRON¹ AND
MADELINE P. BURBANCK, *Emory University*

Determination of percentages of χ -amino acids by the use of ion exchange chromatography in four populations of *Cyathura polita*, two additional species of *Cyathura*, and *Lirceus fontinalis* and comparisons of the percentages were made to discover if there was any correlation

between the number of significant differences and the closeness of the taxonomic relationship. On the generic level, total percentage of amino acids and ammonia of the asellid, *Lirceus*, was significantly different from the totals for *C. polita*, *C. carinata*, and *C. burbancki*. The specific differences were not as pronounced. *C. polita* differed markedly from *C. burbancki*; *C. polita* and *C. carinata* were not very different; and *C. carinata* and *C. burbancki* differed only in percentages of alanine and ammonia. Interpopulation comparisons showed positive correlation with certain ecological differences; an ecologically isolated population differed markedly from other Florida populations, and two populations with similar habitats differed only in the percentage of methionine. The evidence suggests that percentages of χ -amino acids could be used as an aid in determining ecotypes. (Work supported by N.S.F. Grant GB-3122 and research grant (PHS-E795) from the Institute of Allergy and Infectious Diseases of the National Institutes of Health, Public Health Service.)

¹ Present address Oak Ridge National Laboratory

(168)

Experiments with embryos of *Ascaris lumbricoides* var. *suum* in vacuo

KENNETH D. BURNHAM
The University of Tennessee

Ascaris lumbricoides var. *suum* embryos, at several stages of development, were subjected to a vacuum of three to six mm Hg for thirty minutes duration. The experimental conditions utilized were designed to simulate commercial practices employed in the vacuum cooling of produce, a process widely used in Arizona and California. In comparison with controls, no adverse effects in development of embryos were noted during three weeks of observations.

(177)

Thymidine phosphorylase activity in chicken erythrocytes infected with avian malaria, *Plasmodium lophurae*

J. J. CAPONE AND R. W. HULL
Florida State University

Thymidine phosphorylase activity has been found in the *Plasmodium lophurae* and chicken erythrocyte complex. Preliminary investigations have shown that the enzyme is membrane-bound and sensitive to inactivation by lipid solvents and free oxygen or oxidizing agents. It has been differentiated from the hydrolases by its dependency on phosphate. The enzyme is specific for thymidine. It was also found that the early stage chicken reticulocyte possessed a high specific activity of thymidine phosphorylase but the activity decreased logarithmically as the cell matured into a functional erythrocyte. The mature erythrocyte does not demonstrate thymidine phosphorylase activity. There is a linear relationship of enzyme activity to parasitemia in the early stages of infection, i.e., before the chicken responds to the hemolysis caused by the segmented parasites rupturing the cell, with a strong and sudden reticulocytosis, generally being initiated 72 hours after the infection began.

The origin of the enzyme, i.e., host or parasite, is unknown since it cannot be separated from the membrane of lysed infected erythrocytes. At present it can-

not be separated from the membranes without inactivation, thus suggesting the possibility of reactivation of host originated enzyme by the parasite. Possible mechanisms are discussed.

(150)

Seed Germination Responses from the Salt Marsh Grass *Distichlis spicata* (L.) Green, (Angiospermae, Poales Poaceae): Ecological Aspects

GEORGE E. CARTER, JR. AND RICHARD J. KELLY
Wake Forest University

On the assumption that the flowering plants occurring in the mean-high-tide area of the estuarine salt marshes are obligate halophytes, the seed germination requirements of *Distichlis spicata* were investigated. It was determined that *D. spicata*, a facultative rather than obligate halophyte, sets dormant, viable seeds which appear to be non-photoblastic. Several treatments were found to give high germination percentages. Among these were after-ripening (stratification), leaching-scarification, and osmotic shock. These pre-germination requirements will be related to the general estuarine ecology.

(134)

Chemotaxonomic Studies in the Southeastern Species of *Luzula*

JANICE C. COFFEY, *Queens College*

The genus *Luzula* is represented in the southeastern United States by four species: *Luzula acuminata* Raf. var. *acuminata* and var. *carolinae* (S. Wats.) Fern., *L. bulbosa* (Wood) Rydb., *L. echinata* (Small) Hermann, and *L. multiflora* (Retz.) Lej. No published data is available concerning the secondary pigments occurring in this genus. This investigation proposes to establish flavonoid patterns in these species and to use these patterns as a basis for further investigations into the nature of variation in this genus. Identification of the consistently occurring flavones and flavonols is offered.

(10)

Net Primary Productivity of Young Big Tooth Aspen (*Populus grandidentata*) stands in Cheboygan County, Michigan

ARTHUR W. COOPER
North Carolina State University

Following destruction of original forests of red and white pine on sandy soils in northern lower Michigan by timbering and fire, sprout stands of Big tooth aspen (*Populus grandidentata*) have developed. Permanent sample plots established on property owned by the University of Michigan Biological Station provide data on rates of species change and permit quantitative reconstruction of the general pattern of succession. In addition, relationships between diameter and weight of trees, determined from destructive sampling, permit estimates of standing crop of trees at given times during the succession. Data on changes in species composition and size from the permanent sample plots have been combined with estimates of the standing crop of above ground biomass of plants to provide generalizations on changes in rates of net primary productivity during the first 50 years of the succession.

(123)

Productivity and Species Diversity of Plankton, Norris Lake, Summer, 1968

CYNTHIA COWGILL AND A. RANDOLPH SHIELDS

Plankton samples from four embayments of Norris Lake were used to relate productivity and species diversity. In general, the two parameters are inversely related. The most significant observation was the increase in diversity values without any increase in total productivity adjacent to marinas where several houseboats are moored. In one instance this was associated with oxygen depletion. Plankton production in Norris Lake is relatively low.

(142)

Demonstration of a Potassium-Sensitive, Calcium-Activated Adenosine Triphosphatase in the Meristematic Cells of Lost Pine.

T. J. CULPEPPER¹ AND IOLA T. MCCLURKIN
University of Mississippi

Calcium ions activated adenosine triphosphatase (ATPase) activity in the nuclei of the meristematic cells in root tips from lost pine seedlings, a race of *Pinus taeda* L. Sodium, in conjunction with equivalent concentrations of calcium and ATP, inhibited ATPase activity, whereas potassium ions under the same circumstances further increased the activity of calcium. This specific cation-stimulated ATPase requires equivalent concentrations of calcium and ATP, and magnesium ions cannot substitute for calcium. It has an optimum pH of 5.5 and is located only in the nuclear component of the cell.

The determination of the amounts of phosphate liberated by the experimental cations from tissue homogenates of the seedling root tips complemented and paralleled the histochemical results of this study.

¹ Now at University of Southern Mississippi

(187)

A Survey of the Helminths of Aquatic Turtles in North Carolina

FROST H. CUNNINGHAM
North Carolina State University

During July 1967 to October 1968, one hundred and one specimens of the following species of aquatic turtles were collected in six counties in North Carolina: 29 *Pseudemys scripta scripta*, 28 *Chrysemys picta picta*, 18 *Sternotherus odoratus*, 14 *Chelydra serpentina serpentina*, 6 *Kinosternon subrubrum subrubrum*, 5 *Pseudemys floridana floridana*, and one *Clemmys guttata*. Twenty three species of helminths were obtained as follows: fifteen species of trematodes; three species of acanthocephalans; four species of nematodes; and one species of leech. *Pseudemys scripta scripta*, the yellow bellied turtle, harbored the widest variety of helminths. *Spirotricha chelydrae*, a nematode, was the most abundant parasite both in distribution and number per host. Nine new host records and ten new locality records are reported from North Carolina.

(173)

The Effects of X-radiation on the Blood Picture of
Mice Infected with *Heligmosomum skrjabini*
(Nematoda: Heligmosomidae)

JAMES R. CUNNINGHAM, *Clemson University*

The effects of concurrent X-radiation and parasitism by an intestinal nematode, *Heligmosomum skrjabini* (= *Nematospiroides dubius*), on the blood picture of F₁ hybrids of C3H/Anf and C57BL laboratory mice has been studied. Mice were inoculated orally with 200 infective larvae and irradiated with one of four different dosages of total body irradiation so that the leucopenia resulting from the irradiation coincided with the leucocytosis caused by the parasite. Hematological data included total and differential leucocyte counts, and packed cell volumes (hematocrits). Total egg production was also investigated using a modified McMaster technique. Significant results of the experiment will be discussed.

(17)

Oil-Field Succession Six Years After Significant
Gamma-Neutron Radiation Exposure

CHARLES DANIEL, *Georgia College*

Old-field succession on a flood plain in North Georgia received total exposure of 44,600 rads in two significant burst during initial stages of development. Third year succession reverted to first year dominant *Diodia teres*, where perennial invasion did not occur. Where previously established in third year dominance, perennial *Monarda punctata* maintained dominance by vegetative budding until fifth year despite irradiation. Six years later with no further significant irradiation to affect grasses and forbes, *Lespedeza cuneata* and *Monarda* shared dominance, however tree invasion was insignificant. Non-irradiated control succession was dominated by *Monarda* in the third and by *Monarda-Smilax bonanox* in fifth year succession. Six years later both control areas had an open pine canopy above a grass-forbe *Monarda-Smilax-Andropogon virginicus* dominance.

(49)

Ultrastructure Studies of Several Marine
Dinoflagellates (Division: Pyrrophyta)

JOANNE T. DAVIS AND CLINTON J. DAWES
University of South Florida

Dinoflagellate species, *Gonyaulax polyhedra*, *G. monilata*, *Protoceratium reticulatum*, *Pyrodinium bahamense*, *Prorocentrum gracile*, and *Gymnodinium splendens*, isolated from the Gulf of Mexico and cultured by the Florida Board of Conservation, were examined with the electron microscope. The general ultrastructure of the dinoflagellate is described with the primary studies based on *Gonyaulax polyhedra* and *G. monilata*. The other species were used as comparative organisms. Typical eukaryotic organelles were found, and in addition, several unusual features were noted. Trichocysts were similar in all the species examined except *Prorocentrum gracile*. The chloroplast membrane for *G. polyhedra* consisted of a triple membrane. An unusual concentration of concentric mitochondria was encountered in *Pyrodinium bahamense*. Thecal plates were apparently surrounded by two unit membranes, the thecal mem-

branes, one which encircled each plate and another membrane which covered the whole cell. Directly beneath the plasmalemma was a layer of small tubules. The nucleus contained numerous condensed fibrillar chromosomes.

(73)

Courtship and Intermale Behavior of the
Jumping Spider, *Zygoballus bettini* Peckham

JOHN D. DAVIS
Mississippi State College for Women

A study of courtship and intermale displays of the jumping spider *Zygoballus bettini* Peckham indicates behavioral differences correlated with male polymorphism. Three forms of males were distinguishable by overall size and proportions of fang and first leg, both of which are releasers in displays. Using stimuli of known intensity, fifty courtship display sequences were filmed for each size group. Motor elements of display were found to be highly constant, but were patterned into units in which the male approached the female rapidly or more slowly. Typically, the rate of approach accelerated as the male neared the female, but the total number of rapid units versus slower units differed for the smallest males and other groups. Seventy per cent of the total movement units of the smallest males involved slow approach versus fifty per cent for the other groups. The largest males tended to hold their first legs farther from the vertical than the other groups: this difference was also seen in intention movements. Intermale pairings resulted in a different set of motor patterns and grappling without injury, except when small males were paired with the largest males, in which case the small males were attacked without releasing the agonistic ritual movements of the large males.

It is suggested that the small males may represent the initial male size, and that selective pressure for supernormal releasers has produced the larger forms.

(50)

An ultrastructural study of the colorless green
alga, *Saprochaete saccharophila* Coker and Shanor
(Chlorophyceae, Chaetophorales,
Saprochaetaceae)

CLINTON J. DAWES
University of South Florida

The cytology of a colorless green alga *Saprochaete saccharophila* Coker and Shanor (Chaetophorales) has been studied utilizing light and electron microscopes. The eukaryotic cell structure is very similar to fungal cells, containing Golgi bodies, mitochondria, nuclei and glycogen-like bodies. The cell wall contains microfibrils arranged parallel to the filament axis and an abundance of amorphous material. The possible chemical constitution of these microfibrils is discussed. Small protrusions from the cell wall project into the cell lumen and are reminiscent of trabeculae found in *Caulerpa*. The fungal and algal features of this organism are compared and discussed.

(165)

Ultrastructure of Mitosis in *Volvox aureus*

T. R. DEASON, W. H. DARDEN, JR., AND
SARAH ELY, *University of Alabama*

Male colonies of the M5 strain of *Volvox aureus* can be induced at will, and the developing sperm packets provide a source of rapidly and synchronously dividing cells. Colonies with dividing male initials were selected using disposable glass pipettes, fixed in glutaraldehyde and osmium, and embedded in an Epon-Araldite mixture. Previous reports of intranuclear division are confirmed, and the role of microtubules and basal bodies in mitosis is discussed.

(26)

Phylogenetic and Systematic Significance of Leaf Vascularization in Dilleniaceae (Angiospermae-Dicotyledoneae)

WILLIAM C. DICKSON
Virginia Polytechnic Institute

The mature foliar nodes of Dilleniaceae (*sensu stricto*) are unilacunar one-trace, trilacunar, and multilacunar. The unilacunar and multilacunar patterns are both derived from the trilacunar condition. Cotyledonary nodes are unilacunar two-trace or unilacunar one-trace. Nodal anatomy discredits a close relationship between the Dilleniaceae and Theaceae. Descriptions of petiole venation patterns reveal that vascular cylinders composed of widely dissected bundles are more primitive than those with fused bundles and more complex medullary traces. The vascularization of the lamina displays fundamental phylogenetic trends of specialization in both major and minor venation. Bundle sheath cells are either parenchymatous or sclerenchymatous and may enclose the terminal tracheids. Slender venation patterns lacking bundle sheathing are less specialized than coarser-veined leaves with massive bundle sheathing. When considered together, nodal anatomy and foliar vasculature are frequently of excellent diagnostic and taxonomic value.

(115)

The Use of the Sequential Comparison Index as a Biological Evaluation of Stream Pollution

KENNETH L. DICKSON AND JOHN CAIRNS, JR.
Virginia Polytechnic Institute

Six sampling stations were located on a twelve-mile stretch of the New River in Giles County, Virginia, which received three different potential sources of pollution. Representative and comparable samples of macro-invertebrates were obtained at each station using a bottom net and a Peterson dredge. Evaluation of data was made using the Sequential Comparison Index (S.C.I.)¹ and taxonomic techniques, such as species diversity, the Biotic Index, and the breakdown into intolerant, facultative, and tolerant categories.

Interpretation of the data shows similarities between all techniques of evaluation. When unit effort and degree of professional specialization required are compared for the various techniques, the S.C.I. proves to be a simple, rapid, and reliable technique for the evaluation of the biological effects of pollution. Although taxonomic specialization is not required for the use of the S.C.I., a basic understanding of aquatic ecology is essential for

its interpretation. (Research supported by Manufacturing Chemists Association.)

¹ Cairns, John, Jr., et al., *J. Water Pollution Control Federation*, 40, 9, 1607 (1968).

(186)

Simple Method of Preparing Intestinal Tracts of Mice for the Purpose of Studying Adult *Trichinella spiralis* in situ

H. DONALD DOBBS, *Wofford College*

A method has been devised for mounting and staining in toto intestinal tracts of mice so that entire populations of adult *Trichinella spiralis* can be studied in situ. Small and large intestines are mounted on strips of heavy absorptive paper, slit longitudinally, and fixed with Bouin's for 20-30 minutes. The intestinal strips are hydrated, stained with Delafield's hematoxylin for 5-10 minutes, and then transferred to 35% alcohol. The strips are "read" under a magnification of 20X. The position and sex of each worm and the locations of Peyer's patches are recorded on a plotting chart in scale with the intestinal tract. These preparations permit investigation of spatial relationships among individual worms, and between worms and intestinal structures (villi and Peyer's patches), and the linear frequency distribution of adult trichinella in the same host. This method is being used in conjunction with mass recovery techniques for the purpose of studying the effects of immunity on distributional patterns of adult trichinella in the small intestine.

(92)

Population Density and Home Range Size of the Eastern Box Turtle (*Terrapene c. carolina*) in Eastern Tennessee

RICHARD A. DOLBEER, *University of Tennessee*

By systematic searching of a 22 acre woodland near Knoxville, Tennessee, 270 box turtles were captured, marked, and released during 1968, with many being recaptured a number of times. The location of each turtle captured was recorded by reference to trees marked at 250 foot intervals. From the data on locations of recaptured turtles, the average home range diameter for adults was estimated to be 250 feet. A population estimate of seven to nine turtles per acre was obtained by the use of capture-recapture data. These results are somewhat different than the estimates given for the same species by investigators in Maryland and Indiana in which the home range diameter was estimated to be 325 to 375 feet and the population density four to five turtles per acre. This indicates that the habitat used in this study is somewhat more suitable for the box turtle in that it supports a higher population with a smaller home range for individual turtles.

(40)

Threonine Deaminase Feedback Inhibition in a Pseudomonad Species

BOBBY F. DRAKE AND VICTOR E. FEISAL
Memphis State University

Feedback inhibition of threonine deaminase was studied in a Pseudomonad species. Investigations with crude cell-free extracts revealed (I) concentrations of isoleucine

necessary to inhibit the threonine deaminase reaction from 0 to 100% at substrate concentrations of 0.4M, 0.2M, and 0.1M threonine, (II) enzymatic activity at different pH, in which pH 9 was determined as optimum, (III) enzymatic activity at different temperatures, at which 40 C was determined as optimum, and (IV) the enzyme to be specific for the L forms of threonine and isoleucine.

It, also, was noted that as substrate concentration was doubled the amount of isoleucine to inhibit the reaction by 50% was doubled. Higher concentrations of isoleucine were required to completely inhibit the reaction at pH higher than 8. Enzymatic activity was greater under alkaline conditions, as activity ceases at a pH below 7.

(137)

Corona Variation in Southeastern U.S. *Matelea* (Asclepiadaceae)

DONALD J. DRAPALIK, *Georgia Southern College*

I recognize nine species of *Matelea* in the Southeastern United States. Six species display a considerable amount of corona variation as compared to the other three. These six species include all those cited under *Odontostephana*, Alexander in Small, *Manual Southeast Flora*. Garden studies have shown that most of the variation is due to genetic rather than environmental factors, and that artificial interspecific F_1 hybrids generally have coronas that are intermediate between the two parents. Corona variation appears to be random in respect to all other characters studied. All variants of a single species are frequently found within single natural populations. In spite of the tremendous amount of corona variation, each species usually has a "typical" corona pattern which can be used as a diagnostic tool.

(167)

The Chemical Characterization of the Notochordal Sheath in Bullfrog Larvae

KIAH EDWARDS, JR. AND ROY HUNTER, JR.
Atlanta University

The notochordal sheath of larval amphibians (*Rana catesbeiana*, Class Amphibia, Order Anura), which is found directly around the peripheral and vacuolated notochordal cells, consists of two components: an inner fibrous and an outer elastic lamella. In an effort to clarify data on the chemical nature of the sheath, the method of enzymic hydrolysis was employed. Sections of tissue from the tails and isolated notochordal sheaths were observed before and after treatment with hyaluronidase, collagenase, gelatinase, elastase, lipase, steapsin, and proteinase. The sheath was unaffected by hyaluronidase treatment. The inner fibrous lamella and the basement lamella of the epidermis (a well defined collagenous structure) were completely hydrolyzed by collagenase and gelatinase. Proteinase treatment resulted in a disruption of the compactness of the fibrous lamella. The outer elastic lamella of the sheath was not affected by elastase and the other enzymes, either singly or in combinations. Neither component of the sheath was altered by lipase and steapsin, although these enzymes did cause a disruption of the vacuolated notochordal cells. These data confirm the collagenous nature of the fibrous lamella; however, the precise nature of the elastic lamella remains unknown.

(130)

Macroscopic Temperate Zone Epiphyllae

E. ANN ELLIS AND JOE A. EDMISTEN
University of Georgia

Ruinen (1961) described the environment for epiphytes on the external surfaces of perennial, tropical leaves (the phyllosphere). In the tropics, well-developed phyllosphere populations (epiphyllae) are of general occurrence. Ruinen also recognized a successional sequence of epiphyllae establishment. Fungi, algae, lichens, and liverworts have been observed growing on leaves of *Magnolia grandiflora*, *Ilex opaca*, and *Serenoa repens* in southwest Georgia. Prominent epiphyllous species from these leaves have been identified. The successional sequence of these epiphyllous species is being studied. Comparisons of the temperate zone epiphyllae and tropical epiphyllae will be made. Ektachrome slides of epiphyllae will be shown.

(29)

Description and Breaking of Dormancy in Corms of Jack-in-the-Pulpit (*Arisaema* Spp.)

TIM T. ELLIS AND VARLEY E. WIEDEMAN
University of Louisville

As one of the spring herbaceous perennials Jack-in-the-Pulpit develops from a corm. Corms from a natural population were divided into four categories. Three of the categories, based on corm size, are suggested to correspond to different age groups. Plants of the fourth category, bud corms, were tenuously attached to parent corms and lacked the root system characteristic of the other groups. Only plants of the largest category developed flowers on their vegetative shoots. Breaking of dormancy was accomplished by chilling corms collected in July for at least two months at a temperature of 4 C. Development of plants seemed to follow the sequence found in nature.

(67)

Preliminary Investigations of Protein-Bound Iodine in the Mongolian Gerbil (*Meriones unguiculatus*)

MATTIE D. FARMER AND GEORGE W. TATE, JR.
Memphis State University

The Mongolian gerbil (*Meriones unguiculatus*) has been investigated for possible use as a clinical research animal for studying thyroid physiology. Using a modification of the technique of Grossman and Grossman, PBI (protein-bound iodine) values and total iodine volume were determined for the gerbil. The average PBI value was $2.38 \pm .25$ ug/100 ml, and the average value for total iodine volume was $6.1 \pm .39$ ug/100 ml. The action of sodium salicylate as a possible factor in the deiodination of thyroxine was also investigated.

(166)

Observations on Chinese Hamster (*Cricetulus griseus*) Metaphase Chromosomes with the Scanning Electron Microscope

ROBERT H. FETNER, *Georgia Institute of Technology*

This report describes our preliminary investigation on metaphase chromosomes in Chinese hamster (*Cricetulus*

griseus) cells using the scanning electron microscope. The material used was a fibroblast cell culture in the first transfer from minced embryos.

(164)

Effects of Light and Temperature on the Ultrastructure of Stage IV Cells of *Chlorogloea fritschii* (Cyanophyceae, Chroococcales)

DAVIS L. FINDLEY AND PATRICIA L. WALNE
University of Tennessee, Knoxville

Experiments have shown the effects of varying conditions of light and temperature on the morphology of the blue-green alga, *Chlorogloea fritschii*. Manipulation of the light intensity from 25 to 700 ft-candles of light and temperature from 25 to 45 C results in conditions under which predictable morphological stages predominate. At the extreme temperature of 45 C, low light intensity (60 ft-c) results in 100% Stage IV cells (unicellular, endospore forming), and high light intensity (600 ft-c) results in only 25% Stage IV cells and 75% Stage I cells (short filaments). The present study provides comparative data on the ultrastructure of cells grown under these conditions of temperature and light intensity. The possible effects of various light qualities on the morphology and ultrastructure of the organisms will also be considered.

(60)

In Vitro Experimental Effects of Radiocobalt 60 on Rabbit Polymorphonuclear leucocytes

DIANE OAKERSON FLEMING, *Memphis State University*

The eosin dye exclusion test is the only significantly sensitive method found in the present study to measure the radiation response of rabbit polymorphonuclear leucocytes in the first three hours following radiation doses of 50,000-150,000 rads. These radioresistant cells show sensitivity to radiation at 100,000 rads. Addition of bacteria to the cells for a phagocytic test lowers the dose of radiation necessary for this loss of cell viability to 50,000 rads. The phagocytic index, percent phagocytosis, and bactericidal capacity of these cells are not significantly changed by these levels of radiation; a few studies indicate sensitivity in the 250,000-350,000 range. Intracellular (lysosomal) enzymes such as lysozyme and alkaline phosphatase (AP) do not vary in activity at the 50,000-150,000 rad levels. The post-radiation interval of measurement is important since cell viability and AP activity decrease significantly as a function of time. A three-way analysis of variance is used to determine the statistical significance of the variations due to radiation, the time interval, and the randomly bred rabbits. A model is described for testing the "enzyme release" hypothesis of radiation damage to the cell.

(52)

A Morphological and Cytochemical Study of *Tritrichomonas augusta* (Alexeieff) 1911

JOSEPH C. FLOYD AND FELIX H. LAUTER
University of South Carolina

New information on the cytochemistry of *Tritrichomonas augusta* is presented in this study. Also, the morphology of the organism is redescribed.

DNA was found to be located in the nucleus, being demonstrated there by the Feulgen nucleal reaction and

the methyl green-pyronin Y staining procedure. The DNA is of the double-stranded type. RNA is located in the cytoplasm and the nucleoplasm. The specificity of the Feulgen nucleal reaction and the methyl green-pyronin Y staining reaction was verified by the use of the enzymes DNase and RNase.

Glycogen was demonstrated by Best's carmine stain, the periodic acid-Schiff reaction, and the Bauer Feulgen reaction. The axostyle stained positive for glycogen, the walls giving a positive reaction and the central region remaining unstained. The perinuclear cloud is composed of glycogen granules. Glycogen particles were found in the cytoplasm. Salivary amylase and diastase were used to substantiate the results of the stains for glycogen.

(180)

Influence of Weather on the Intensity of Infection of Bighorn Sheep with Lungworms of the Genus *Protostrongylus* (Nematoda: Protostrongylidae)

DONALD J. FORRESTER, *Clemson University*

During a ten year period (1959-68) lungs from Rocky Mountain bighorn sheep (*Ovis c. canadensis*) were examined for infections by the lung nematodes, *Protostrongylus stilesi* and *P. rushi*. All lungs were collected from rams over three years of age which had been shot during October, November, and December of each year by special-permit hunters in the Sun River game area of western Montana.

Year to year changes in intensity of infection were studied by measuring the surface areas of lesions caused by *P. stilesi* and by counting the numbers of adult *P. rushi* for each lung. The variations were correlated with precipitation and temperatures during the preceding spring months, especially April and May. These observations will be discussed in relation to the activities of the land snails which serve as intermediate hosts of these lungworms. (Supported, in part, by National Science Foundation grant G-19422.)

(172)

Reproductive Performance of a Laboratory Colony of deer mice, *Peromyscus maniculatus*

DONALD J. FORRESTER, *Clemson University*

Certain aspects of the breeding activities of a laboratory colony of wild and first-generation *Peromyscus maniculatus* were studied over a 23 month period.

Data on more than 600 litters and 2500 offspring were obtained. Average litter size was 4.3 for all litters and 4.1 and 4.7 for litters born to wild-trapped and first-generation females respectively. The range for numbers of young per litter varied from 1 to 7 for wild females and 1 to 9 for litters of first-generation females. More males than females were born to both types of females. Litters born to wild and first-generation females showed an increase in size up to the seventh pregnancy. The incidence of pregnancy was highest in first-generation females. Reasons for the better reproductive performance of first-generation females will be suggested. (Supported in part by Graduate Training Grant 5T1-762 from the U.S. Public Health Service.)

(22a)

An Example of the Use of Color Infrared Aerial Photography for Salt Marsh Gradient Analysis

WILLIAM A. FOSTER, *North Carolina State University*

The relative importance of 7 types of marsh vegetation on the Lockwood Folly River, North Carolina, was estimated through the use of color infrared aerial photographs. Vegetational changes inland from the inlet along this tidal river are a function of environmental gradients such as salinity, elevation, and substrate. The pattern of vegetational change along this composite gradient indicates likely areas for future studies on factors limiting the distribution of certain plant species.

(70)

Notes on the Migratory of the Southern Harvester Ant (*Pogonomyrmex badius*)

JOHN B. GENTRY, *University of Georgia*

Life history studies of the southern harvester ant, *Pogonomyrmex badius*, are in progress at the Savannah River Plant near Aiken, South Carolina. One interesting part of the studies has been observations on the migratory behavior of this seed-eating ant species. The migrations, which take place between May and October, occur across the surface of the ground in the form of a line of ants carrying brood and food stores from the old to a new colony site. In some areas, up to 97% of the colonies migrate one time during the summer. As many as 40% of these colonies may undergo a second migration.

The stimulus, or stimuli, which results in the migration of *P. badius* colonies is not known. Normally, only a small part of the worker force is active above ground at any one time. However, during migration, the entire colony is exposed. Apparently, this risk is necessary to insure survival of the colony.

(11)

The Ecological and Taxonomic Distinctness of *Carya carolinae-septentrionalis* and *Carya ovata* in the Southeast

EDWARD L. GIBBON, *North Carolina State University*

Carolina shagbark hickory (*Carya carolinae-septentrionalis*) and shagbark hickory (*Carya ovata*) have been considered as separate species or combined as a single species by various authors. In certain areas of their range of sympatric occurrence they occupy what appear to be distinctly different sites while in some locations they occur on the same site.

Soil samples were collected from beneath representatives of both taxa. These samples were analyzed for selected properties including available phosphorous; exchangeable calcium, magnesium, potassium, and aluminum; and particle size distribution. A taxonomic analysis of the two taxa, using vegetative criteria, has been made. The result of these ecological and taxonomic investigations will be reported.

(90)

Structure and Dynamics of the Yellow-bellied turtle, *Pseudemys scripta* (Reptilia: Chelonia: Emydidae) in an Artificially Heated Reservoir)

J. WHITFIELD GIBBONS,
Savannah River Ecology Laboratory

Individuals of the yellow-bellied turtle, *Pseudemys scripta*, in a heated reservoir on the Savannah River Plant reach exceedingly large body sizes and maintain extraordinary juvenile growth rates when compared with turtles of this species from other populations on the Savannah River Plant. Increased aquatic temperatures may be responsible in some way for these observed growth differences. The increased growth rates result in certain changes in population structure and dynamics which have interesting consequences on the population ecology of this species.

(109)

Mass Accumulation of Protozoan Microorganisms

STEPHEN M. GITTLESON AND BARBARA WOODRUFF,
University of Kentucky

During an investigation of vertical aggregations of protozoa (Gittleston and Jahn, 1968) it was observed that by reducing the surface area of cultures, the aggregating organisms would sediment in massive numbers. The highest relative concentration factors (ratio of cells/ml in concentrate to cells/ml in culture) are about 260 for *Polytomella agilis*, 240 for *Polytomella caeca*, 80 for *Astasia longa*, 70 for *Chlamydomonas reinhardi* (–), 50 for *Chlamydomonas reinhardi* (+), 50 for *Euglena gracilis*, and 40 for *Tetrahymena pyriformis* where cells/ml in culture are about 100,000, 700,000, 300,000, 1,000,000, 2,600,000, 400,000 and 100,000, respectively. All organisms were grown axenically in a medium of 0.1 g sodium acetate, 0.2 g yeast extract and 0.1 g tryptone/100 ml distilled water in 1,000 ml batches and transferred to 250 ml burettes for mass accumulation (23 to 26 degrees C). Direct cell counts were made using the Sedgewick-Rafter method.

(Research supported by the University of Kentucky Research Foundation).

(183)

A Study of the Validity of Certain *Spirorchis* Species. (Trematoda: Digenea)

C. G. GOODCHILD AND VIRGINIA L. MARTIN
Emory University and Queens College

Eggs from the tissues of wild *Chrysemys picta* captured in Georgia were used to establish the life cycle of *Spirorchis scripta* in the laboratory. Two lines of parasites were begun from monomiracidial infections in the snail, *Menetus dilatatus*. Hatchling *C. picta* obtained from commercial suppliers and exposed to cercariae of these parasites were grown under a varying range of conditions until sacrificed to permit recovery of adult worms. Worms were prepared as whole mounts and subjected to a series of measurements set up by other authors to characterize different species of *Spirorchis*. This work strongly suggested the synonymy of *S. picta* and *S. elegans* with *S. scripta*.

The ASB Bulletin

Volumes 11-15
1964-1968



Published by
The Association of Southeastern Biologists, Inc.
C. W. HART, JR., EDITOR

Index to Volumes 11-15, 1964-1968

This is the third of a series of five-year indices planned for the *ASB Bulletin*. The author index includes authors of abstracts and articles, but the subject index does not include abstract titles. Those who plan to bind the *Bulletin* should note that this index and title page can be removed and bound with Volume 15 without disturbing the sequence of pages in this issue.

Subject Index

Abstracts

Abstracts of papers presented at the ASB annual meeting in:

1964, Atlanta	11:38
1965, Charlottesville	12:42
1966, Raleigh	13:29
1967, Columbia	14:22
1968, Athens	15:29

Articles

AAAS Berkeley Meeting	12:95
The AAAS Montreal Meeting	11:89
AAAS Washington Meeting	13:71
American Society of Plant Taxonomists Elects New Officers and gives Cooley Award	11:11
Americans Tables Committee Reviewing Applications for Naples Zoological Station	12:68
The Anatomy of the Phoenix. — Perry C. Holt	11:27
An Appraisal of the Present and Future of Estuarine-Oceanographic Laboratories of the Southeast:	
Federal Laboratories. — T. R. Rice	11:79
Cooperative Training Programs. — L. R. Pomeroy	11:82
State Supported Laboratories. — Albert Collier	11:83
The Benefits of Systematic Biological Collecting from Navigation Buoys. — Arthur S. Merrill	12:3
Biological Abstracts B.A.S.I.C. Retrieval Aid	11:64
Biology and a Liberal Education. — E. Ruffin Jones	13:3
Charles Ray, Jr., Receives Meritorious Teaching Award for 1966	13:75
Clam-Toting Turtle. — Robert Robertson	13:66

Conference on Distributional History of Invertebrate Biota of Southern Appalachians	15:28
Constitution and By-Laws of the Association of Southeastern Biologists	13:15
Cooperative Projects between Cape Haze and Riverview High School Laboratories	11:12
CUEBS Southeastern Regional Conference	12:8
Current Research on Vegetation in the Southeastern States. — A Symposium Co-Sponsored by the ASB, the Ecological Society for the Study of Evolution. To be held at the AAAS Meeting in Washington, D. C., on 29 December 1966	13:71
Current Research on Vegetation in the Southeastern States	15:67
Ecological Studies in the Great Smoky Mountains.—Dorothy L. Crandall	12:63
French Oceanographer at University of Miami	11:62
C. M. Goethe	12:66
A Home in the Sun. — J. Albert Starkey	15:83
Important Deadlines	12:11
International Symposium on Eutrophication for June 11-16 in Madison, Wis.	14:7
Literature Citation Abbreviations — A Waste of Time. — C. W. Hart, Jr. and Betty Ursomarso	11:71
Martin D. Young Appointed Director of Gorgas Memorial Laboratory in Panama	11:86
Multi-Lecture Approach Used at University of Georgia in Introductory Biology Classes	15:7
The National Referral Center	13:65

The National Register as a Privacy Invader — Where do we Go from Here. — An Editorial	11:70
Non-Petrified Fossil Fungi. — Frederick A. Wolf	15:8
Notes on the Natural History of Science. — Perry C. Holt	14:71
Notes on Preparation for a Botanical Field Trip to Mexico. — D. R. Windler and C. R. Bell	14:59
NSS Moves to Preserve Shelta Cave	15:76
Orientation in Animals. — E. G. Franz Sauer	11:3
Pesticides in Our Ecosystem: Communication III. — Frank E. Egler	12:79
Pollution's Eternal Triangle. — John Cairns, Jr.	12:35
Project LOCO completes first phase	11:37
Regulations for Collecting in Mexico	14:10
Reinhold Elects James B. Ross New Vice President	12:67
Restoring the Quality of our Environment: What Needs to be Done and How We are Doing It.	13:55
Ruskin S. Frier is Recipient of ASB's 1964 Meritorious Teaching Award	11:73
Sapelo Island Research Foundation and University of Georgia Pursue Joint Programs	11:64
Sarasota: Spawning Ground for Marine Biologists. — John D. Woolever	11:87
Seal Recommended for Adoption by ASB in April	12:32
A Study of Graduate Program in Biology at University of Richmond. — Warwick R.	

West, Jr., and W. S.	
Woolcott	11:9
Today's Biology. — Walter S.	
Flory	11:67
W. Ralph Singleton Appointed	
Director of National Co-	
lonial Farm	13:28

Departments

ASB's January Placement Service	
	11:8, 12:32
Association affairs	11:26, 11:66,
	11:78, 12:34, 12:62, 12:78, 13:2,
	13:22, 14:14, 14:70, 15:18, 15:66,
	15:82
Books and periodicals	11:17, 11:63,
	11:74, 11:94, 12:24, 12:57, 12:68,
	12:92, 13:64, 13:75, 14:9, 14:48,
	15:77, 14:65, 15:92
Letters	14:75
News of biology in the southeast	
	11:19, 11:61, 11:61, 11:74, 11:97,
	12:25, 12:59, 12:71, 12:97, 13:19,
	13:50, 13:67, 13:74, 14:11, 14:53,
	14:76, 15:11, 15:62, 15:79, 14:67,
	15:88

Directories

Alphabetical directory of ASB	
members	12:12

Meetings: ASB

About the meetings:	
Atlanta, 1964	11:13
Charlottesville, 1965	12:9
Raleigh, 1966	13:10
Columbia, 1967	14:3
Athens, 1968	15:3
Program of the:	
25th annual meeting, At-	
lanta, 1964	11:32
26th annual meeting, Char-	
lottesville, 1965	12:38
27th annual meeting,	
Raleigh, 1966	13:23
28th annual meeting,	
Columbia, 1967	14:15
29th annual meeting,	
Athens, 1968	15:19

Obituaries

Arnold, Paul J.	11:92
Boyd, George H.	13:49
Conrad, G. Miles	11:93
Deviney, Ezda	11:93
Goethe, Charles M.	13:54
Good, Henry G.	11:91
Kurz, Herman	13:49

Lewis, Ivey Foreman	11:91
Overcash, Hinton Baxter	13:74
Penney, J. T.	11:92

Author Index

Aboul-Ela, M. M.	11:38, 11:50
Adotey, P. E.	12:42
Aldrich, H. C.	15:29
Aldridge, F. P.	13:29
Alexander, T. R.	15:29
Alvarez, M. Ray	11:38
Amin, J. V.	11:38, 11:49, 11:51,
	11:56, 15:29
Anderson, C. E.	15:29
Angelovic, J. W.	13:29
Applegate, A. L.	11:38
Ashby, W. C.	11:38
Ashworth, L. J., Jr.	11:38
Bacon, C. W.	12:42
Baker, J. B.	11:52
Ball, E. A.	12:42, 13:29, 13:39
Ballal, S. K.	11:38, 14:22, 15:29
Bamforth, S. S.	12:42, 13:29, 14:22,
	15:29
Bangma, G. S.	13:29
Bannister, B.	13:30
Baptist, J. P.	11:39, 13:48
Barbour, R. W.	11:39, 11:47, 15:39
Barclay, F. H.	12:42, 13:30, 14:22
Barnett, J. D.	14:39
Barr, T. C.	12:42
Barras, S. J.	15:41
Bartone, J. C.	13:39
Bartone, J. C.	13:40
Barrett, G. W.	15:48
Barnett, J. D.	13:45
Barrs, H. D.	15:30
Bartels, P. G.	13:49
Bartone, J. C.	13:30
Baskin, J.	14:22, 15:30
Bath, D. W.	14:23, 15:30
Batson, J.	11:39
Batson, W. T.	15:30
Beal, E. O.	13:30, 13:33, 13:35
Beatty, A. V.	11:39, 12:42, 13:30,
	14:23, 15:30, 15:35
Beatty, J. W.	11:39, 12:42, 13:30,
	14:23
Beckerdite, F. W.	15:31
Beirne, C.	14:46
Bell, C. R.	14:59
Bell, S.	11:39
BeMiller, J. N.	15:31
Benjamin, C. R.	15:38
Bennett, H. J.	11:42, 14:30
Bennett, S. N.	14:23
Benson, G. L.	14:23
Bernard, G. R.	11:39, 11:60

Berry, J. W.	14:23
Beyer, E.	15:31
Beyers, R. J.	15:38
Biggers, C. J.	15:31
Bird, L. S.	11:49
Bishop, J. W.	14:23
Biswas, P. K.	11:40
Blair, A.	14:24
Bland, C. E.	15:31
Blessing, R. W.	15:31, 15:47
Boehms, C. N.	14:41
Bogitsh, B. J.	12:43, 13:29, 13:30,
	14:26, 14:39, 15:35, 15:48
Bond, E. C.	14:41
Bonds, E.	15:32
Bostick, P. E.	11:40, 13:30, 15:32
Boykins, E. A.	13:31
Bozeman, J. R.	11:40
Bradley, T.	13:31
Brotzman, B.	11:52
Brown, G. G.	12:43
Brown, G. N.	13:31
Brown, P. I.	14:24
Brown, E. T., Jr.	11:43, 11:46,
	12:43, 13:31, 14:24, 15:32
Bruhn, M. E.	11:40
Buckelew, T. P.	15:32
Burbanck, W. D.	11:50, 13:31, 15:32
Burk, C. J.	11:40, 12:43, 13:32,
	14:24, 15:32
Burns, J. A.	13:34
Burns, R. E.	15:33
Bursey, R. G.	15:33
Bush, D. J.	13:48
Bush, F. M.	11:40, 14:24
Cairns, J., Jr.	12:35, 13:34
Calhoun, F.	15:33
Canonica, P. G.	13:32
Caplenor, D.	14:24
Caponetti, J. D.	11:41
Cardell, R. R., Jr.	11:41
Carlson, J. G.	13:32, 14:25, 15:35,
	15:55
Carmon, J. L.	15:59, 15:60
Carpenter, J. M.	11:56, 14:24
Carroll, J. W.	14:25
Carter, M. R.	15:33
Carver, J. E., Jr.	14:25
Catching, C. A.	15:33
Caudle, C.	14:22, 15:30, 15:34
Chadwick, C. S.	12:43
Chapman, J. A.	14:22
Cheevers, S. P.	15:34
Child, G. I.	15:34
Clabough, J. W.	11:58
Clark, R. C.	15:34
Clausz, J.	13:32, 15:34
Clebsch, E. E. C.	11:40

Coats, G. E.	15:34	Edmisten, J. A.	11:42, 12:45, 13:33,	Gray, I. E.	14:29
Coffey, J. C.	14:25		14:27, 15:36	Greear, P. F-C.	14:29
Cole, A. A.	15:35, 15:55	Edwards, L. B.	15:44	Green, J. H.	11:45
Cole, M. B., Jr.	13:32, 14:25, 15:35,	Egan, W.	14:33	Gregg, K. W.	13:34
	15:55	Eggers, D. M.	14:27, 15:36	Griffin, D. G., III	14:30
Collier, A.	11:83	Egler, F. E.	12:79	Griffith, M. M.	11:46
Collins, H. A.	11:41	Eiland, L.	13:33	Grimm, J. K.	11:46
Collins, R. F.	15:35	Ellis, W. H.	11:42, 15:60	Griswold, D. P., Jr.	15:47
Cooper, A. W.	13:41, 13:46, 13:47,	Engel, D. W.	13:29	Guhardja, E.	11:46
	14:25	Engleman, E. M.	11:43	Haber, A. H.	15:38
Constantin, M. J.	12:44	Esch, G. W.	15:44	Hackskaylo, J.	11:46
Cooper, A. W.	11:41, 13:32	Etges, F. J.	11:48	Haecker, M. H.	15:38
Cosgrove, W. B.	15:49	Eudy, W. W.	13:34	Hale, M. G.	15:39, 15:56
Cotter, D. J.	12:44	Fairbanks, G. W.	11:43	Hale, M. E.	15:39
Couch, J. N.	11:57	Farrell, N. P.	15:29	Hammack, R. E.	13:45
Cowley, G. T.	11:41, 14:23, 14:26,	Fattig, W. D.	14:27	Hammer, R.	11:46
	15:55	Fetner, R. H.	15:37	Hanlin, R. T.	15:39
Craig, R.	15:36	Field, H. M.	12:53	Hardin, J. W.	13:35, 14:24,
Cramer, A. L.	13:35	Findeis, A. F.	11:60		14:25, 15:39
Crandall, D. L.	12:63	Findley, J.	14:33	Harkema, R.	14:30, 14:33, 15:31
Crawford, C. C.	15:35	Fitzpatrick, J. F., Jr.	11:43, 15:37	Harrelson, M.	15:36
Criss, W. E.	11:56	Fleming, L. E.	14:27	Harris, A. H.	11:46, 14:30
Crossley, D. A., Jr.	13:32, 15:57	Flemister, M. R.	13:34	Harrison, D. E.	13:35
Crosthwaite, L.	14:33	Flint, F. F.	14:28	Harrison, F. W.	15:39
Crutchfield, P. J.	11:42	Flory, W. S.	11:67	Hart, C. W., Jr.	11:71
Dahlman, R. C.	14:26	Foard, D. E.	15:37, 15:48	Hartshorn, G. S.	14:30
Damon, C.	14:33	Foin, T. C.	12:45	Harvey, M. J.	11:39, 11:47, 15:39
Darlington, J. T.	13:33	Ford, L.	11:43, 12:45	Harvin, N.	15:58
Davis, D. A.	14:26, 15:35, 15:48	Foreman, C. W.	14:28, 15:37	Hassell, M. D.	11:47
Davis, H. L.	11:42, 12:44, 15:30,	Forthofer, D.	12:45	Hatala, R. J.	14:33
	15:35	Fortman, J. R.	14:29	Haysman, P.	13:38
Davis, J. E., Jr.	12:44, 14:29, 15:35	Foster, N. R.	13:34	Hebert, J. R.	14:30
Dayton, B. R.	13:33, 15:35	Foster, W. A.	15:37	Hellmers, H.	15:39
Deason, T. R.	14:25	Foy, C. L.	15:42, 15:34, 15:37,	Helseth, F. A.	12:46, 15:40
Decker, R. D.	13:33		15:56	Henderson, J. H. M.	11:47, 11:55,
De Jong, D. W.	11:42	Frankenberg, D.	12:45		15:40
Delaney, J.	14:26	Franklin, B. C.	13:39, 14:28	Henderson, V.	11:47
Denton, T. E.	11:52	Frederick, L.	11:54, 11:59, 12:42,	Hendricks, L.	14:30
DePoe, C. E.	13:33		13:34, 14:39, 15:38, 15:41, 15:59	Hennessy, J. P.	12:46
DeSelm, H. R.	11:42, 12:44	Freeman, J. A.	11:47, 12:45	Henry, J. P.	13:48
Dickerson, D. R.	13:40	Freeman, J. D.	14:28	Hermann, H. R.	15:40
Dietz, R. A.	14:26	Friauf, J. J.	14:45, 15:38	Hermann, P. W.	15:40
Dillard, G. E.	11:58	Gaisser, R.	11:43	Herndon, W.	11:45, 11:50,
Dillon, C. R.	15:36	Garoni, L. W.	11:43		13:40, 13:44
Dimmick, J. F.	12:44	Garrard, L. A.	15:38	Herr, J. M., Jr.	13:37, 14:25,
Djatie, S. H.	13:33	Garrett, A.	14:28		14:30, 14:42, 15:40
Doolittle, J. A.	12:49	Garrison, N. E.	14:29, 15:35	Hess, W. N.	11:47
Dorman, W. H.	15:51	Garth, R. E.	14:29, 14:31	Hicks, V. A.	14:33, 15:40
Dove, L. D.	15:45	Gatipon, G. B.	12:45	Hinds, H. R.	12:46, 13:37
Dowden, B. F.	11:42, 14:30, 15:36	Gentry, J. B.	11:45, 14:29	Hobbs, H. H., III	15:40
Dozier, M.	11:54	Gentry, J. L., Jr.	11:43	Hodges, J. D.	15:41, 15:44
Drane, J. W.	14:41	Gerstel, D. U.	13:34	Hogarth, W. T.	13:37
Drapalik, D. J.	15:36	Ghosh, D.	11:45	Holliman, R. B.	11:47, 11:48
Drescher, R. F.	12:44	Gibbon, E. L.	13:34	Hollingsworth, F. H.	15:49
Duever, M. J.	15:36	Gittleson, S. M.	14:29, 15:38	Holsinger, J. R.	12:46
Duke, T. W.	12:45, 14:27	Golley, F. B.	11:45	Holt, P. C.	11:27, 14:71
Dundee, D. S.	15:36	Goodchild, C. G.	13:35	Holton, R. W.	11:48, 15:44, 15:57
Dykes, D. J.	15:47	Gosselink, J. G.	15:43	Hooks, W. S.	14:31
Earle, S. A.	14:27	Grant, R. R., Jr.	13:66	Hoss, D. E.	13:37, 14:31

Howard, J. D.	15:55	Lauter, F. H.	15:32, 15:39,	Metz, C. B.	13:34
Howe, H. B., Jr.	11:48, 12:52,		15:51, 15:59	Meyer, K. A.	15:46
	13:38, 14:43, 15:33	Lawlor, D. W.	15:43	Miller, C. E.	12:49, 13:42, 15:52
Hu, F.	11:41	Leiter, E. H.	13:40	Miller, C. S.	11:38, 11:50
Huber, R. T.	13:38	Lelong, M. G.	13:40	Miller, F. S.	14:35
Hull, H. L.	12:46	Lembi, C. A.	13:40	Miller, G. L.	13:42, 14:33, 15:46
Humm, H. J.	13:38	Leonard, R.	14:33	Miller, G. C.	11:51, 13:38, 14:30,
Humphreys, T. E.	15:38	Lewis, J.-A.	11:55		14:33, 15:31
Humphries, A. A., Jr.	12:46, 13:38	Liles, J. N.	12:48, 14:41, 14:43,	Miller, J. A., Jr.	14:35
Hundley, L. R.	12:47		15:57	Millard, W. R.	15:46
Hunt, E. L.	12:47, 13:40, 14:31,	Linton, T. L.	12:48	Mobberly, W. C.	14:35, 15:47
	14:36	Lorio, P. J., Jr.	15:44	Mohapatra, S. C.	15:47
Hunt, G. E.	11:53, 11:60	Lowy, B.	11:49	Mohler, C. G.	13:42
Hunter, R., Jr.	12:49, 13:33, 14:26,	Loxley, S. S.	13:40	Monk, Carl D.	11:51, 13:42
	15:34	Lucansky, T. W.	14:32	Montgomery, F.	15:56
Hurd, M. P.	15:41	Lucas, H. L.	13:35	Moore, J. H.	15:47
Imhoff, D. S.	14:31	Ludlow, C. J.	14:32	Moore, C. H.	15:47
Island, D.	14:41	Lugo, A. E.	13:41	Morgan, P. W.	11:50, 11:56, 15:31,
Jackson, C. G., Jr.	12:47, 13:38,	Luquire, K. B.	15:44		15:47, 15:50
	15:41	Lutz, P. E.	11:49, 12:48, 14:32	Morrison, R. M.	11:51, 12:49
Jackson, J.	12:47, 15:33	Lytle, J. B.	12:48	Moxley, S. C.	14:36
Jefferson, J. H.	13:48	Ma, T.-H.	14:42	Mueller, S.	13:42
Jenner, C. E.	12:48, 15:41	Mackey, B. L.	15:44	Mulcahy, D. L.	11:51
Jinks, W.	14:31	Mahoney, J. J., Jr.	15:44	Mullenax, R. H.	12:44
Joham, H. E.	11:45, 11:49, 11:51,	Maitland, P. S.	14:38	Mullins, D. W.	14:27
	11:56, 15:41, 15:42	Majumdar, S. K.	13:45	Mullins, J. T.	12:49, 14:36, 15:47
Johanson, L.	15:42	Marcus, T. R.	13:43	Murdoch, M. B.	13:49, 15:59
Johns, E. B.	15:42	Marland, F. C.	15:44	Murdy, W. H.	11:43, 13:41, 13:42,
Johnson, C. E., Jr.	15:42	Maroney, S. P., Jr.	12:48		15:44
Jones, D. A.	12:47, 13:38, 14:32,	Marra, M.	15:44	Myles, M. R.	11:51
	15:42	Martin, V. L.	11:50, 13:35	Neff, S. E.	15:44
Jones, D. W.	15:42, 15:56	Matthews, J. F.	13:41, 14:40,	Nelson, G. E.	15:48
Jones, J. M.	13:39		15:44	Neubert, S. A.	15:48
Jones, E. R.	13:3	Mayberry, B. D.	11:50	Nhu, D. C.	14:24
Jones, S. B., Jr.	11:48, 13:39,	Mayes, McK.	14:45	Noggle, G. R.	15:53
	14:32, 15:50	Mayou, T.	15:55	Normand, W. C.	11:52, 15:52
Joshi, P. C.	12:42, 13:29, 13:39	McBee, G. G.	11:49	Norris, W. E., Jr.	11:52, 15:48
Kaiser, H. E.	13:30, 13:39	McCaskill, V. H.	15:45	Norris, W. W., Jr.	14:28, 15:33
Katsanos, R. A.	11:52	McCauley, R. W.	15:45	Nunnally, D. A.	12:43, 14:26,
Kcener, C. S.	13:39	McClurkin, I. T.	15:46		15:35, 15:48
Keith, W. B.	15:42	McCormick, J. F.	11:49, 13:41,	O'Conner, J.	13:43
Kelley, C. A.	15:32, 15:47		14:33	O'Dell, D. H.	15:48
Kemp, D. T.	13:39	McCradly, E., III	15:45	O'Dell, H.	13:43, 14:36
Kent, G. C., Jr.,	11:48, 12:45,	McCrary, A. B.	12:48, 15:41	Odum, E. P.	15:48
	12:52, 13:40, 14:32	McCrone, J. D.	12:48, 14:33	O'Kelley, J. C.	11:52, 11:60, 15:32
Kerwin, J. A.	12:47, 13:40	McDonald, J. C.	13:34, 15:45	Olewine, D. A.	14:23, 14:45
Kirby, A. C.	11:48	McGinnis, J. T.	11:53, 12:44	Olexia, P. D.	14:36
Klepper, B.	15:30	McGuire, R. F.	11:50	Omran, R. G.	15:49
Knighton, R. S.	11:41	McHale, J. S.	15:45	Ott, D. W.	15:49
Koch, W. J.	11:48, 15:43	McHale, J. T.	15:53	Outten, L. M.	13:43
Kriegsman, C. O.	12:48	McLaughlin, E. W.	13:41, 14:33	Pallas, J. E., Jr.	11:52
Krissinger, W. A.	15:43	McMichael, B. L.	15:46	Pappelis, A. J.	11:52, 15:31
Krivanek, J. O.	11:49	Mehra, K. N.	15:43	Parchman, L.	11:52
Kucera, C. L.	14:26	Meisner, H. M.	11:50	Parekh, M. C.	15:41
Kuenzel, W. J.	15:43	Mellinger, A. C.	15:46	Parker, B. C.	12:49
LaHaye, P. A.	15:43	Mengebier, W. L.	11:50, 13:47	Parks, J. C.	15:49
Lampton, R. K.	15:43	Mcenzel, R. W.	13:41, 15:46	Parrish, F. K.	15:49
Langston, R.	11:49	Mcrcer, E. P.	13:41	Pattee, H. E.	15:42, 15:47
Laughlin, C. W.	11:51, 15:56	Merrill, A. S.	12:3	Patterson, R. M.	14:36

Patton, E. G.	14:36	Rogers, J. L.	11:55	Stern, S.	12:51
Paulin, J. J.	15:49	Rogers, S. H.	14:39, 15:53	Stewart, S. E.	13:46
Pav, D. I.	13:43	Rohrbaugh, L. M.	12:47	Stidham, J. D.	12:48, 14:41
Paxton, J. H.	15:49	Rollins, D.	13:43	Stiven, A. E.	12:52, 13:46
Pedigo, R. A.	12:47, 13:43, 14:37	Roux, S. J.	15:53	Strickland, P. L.	12:52, 14:41
Perkins, H. F.	13:33, 13:44, 14:27	Rovee, D. T.	12:51	Stroud, L.	13:46, 15:37
Petersen, R. H.	13:43, 14:37	Ruska, W. F.	12:42, 14:42	Styron, E.	11:56, 14:42
Phillips, C.	15:40	Sagawa, Y.	11:55	Stubblefield, S. M., Jr.	15:56
Pickel, V. M.	13:44	St. Amand, W.	14:39	Sutton, D. L.	15:56
Piehl, M. A.	14:37	Salters, A. L.	14:39	Talmadge, S. S.	11:56
Pittillo, J. D.	12:49, 13:44	Satterfield, J. D.	12:51, 14:40	Tandon, S. R.	14:42
Place, J. G.	13:33	Sauer, E. G.	11:3	Tan, B. D.	11:56, 13:46
Platt, R. B.	11:53	Scarborough, E.	11:55	Tanner, J. T.	11:57, 13:47
Plummer, G. L.	12:46, 12:49, 13:44, 13:45, 14:37, 15:50, 15:42	Schelske, C. L.	11:55	Tate, G. W., Jr.	12:52, 13:40
Pomeroy, L. R.	11:82	Schiff, S. O.	11:55	Tate, L. G.	15:56
Pope, R.	15:51	Schmid, W. E.	15:53	Taylor, D. M.	11:56
Powders, V. N.	14:38, 15:50	Schumacher, G. J.	11:58, 12:54	Taylor, F. G., Jr.	13:31, 14:42, 15:56
Powell, R. D.	11:53, 15:46, 15:49, 15:50	Schwarz, O. J.	15:53	Taylor, M. K.	11:56
Price, C. E.	13:44, 14:38, 15:50	Scoggins, R. B.	14:38	Taylor, S. E.	13:47
Price, T. J.	12:45	Seaman, D. E.	15:37	Teas, H. J.	15:56
Prins, R.	12:50, 15:45	Seibert, C. A.	14:24	Tegtmeier, D. O.	15:31
Proffitt, M. R.	13:44	Seibert, R. W.	15:29	Tenney, W. R.	12:52
Pullen, T. M.	11:53, 14:38, 15:50	Seltmann, H.	13:33	Tenore, K. R.	15:57
Pulliam, H. R.	15:48	Seneca, E. D.	14:40	Terman, C. R.	12:52
Purcell, A. E.	11:53, 15:42	Shanks, R. E.	12:42	Terry, C. E.	12:52
Quarterman, E.	13:29, 14:22, 14:44, 15:34	Shannon, W. A.	14:40, 15:54	Thacker, W.	14:42
Ragsdale, H. L.	11:53	Sharp, A. J.	14:46	Thomas, D. D. S.	14:36
Ramger, R. C.	11:59	Sharpley, J. M.	12:44, 14:40	Thompson, J. C., Jr.	11:57
Ramsey, G. W.	11:53, 14:38, 14:42	Shaw, W. N.	13:45	Thomson, J. R.	11:57, 12:53, 14:42
Ray, C., Jr.	12:50	Shear, G. M.	15:54	Thompson, S. O.	13:48, 14:45
Reams, W. M., Jr.	14:38, 15:51	Shervette, R. E.	15:51	Thornborough, J. R.	13:47
Reichle, D. E.	13:44	Shetler, S. G.	14:40, 15:54	Thorne, F. M.	11:57
Rembert, D. H., Jr.	12:50, 14:39, 15:40, 15:51	Simmons, G. M., Jr.	14:40	Tietjen, W. L.	14:43, 15:57
Reynolds, J. D.	11:53, 12:50, 15:51	Sims, A. C., Jr.	12:51	Tisdale, S.	12:53
Rhodes, R. G.	11:53, 13:44	Sine, J.	14:41	Totten, R. E.	14:43
Rhoads, P. B.	15:51	Singh, R. P.	11:55	Tramer, E. J.	15:57
Richardson, B.	15:51	Singhas, C. A.	15:54	Triplett, L. L.	15:38
Richardson, F. C.	11:54	Singleton, W. R.	14:41	Tuck, L. S.	15:57
Rice, T. R.	11:79	Skeen, J. N.	13:45	Turnbull, J. G.	11:48
Riley, H. P.	11:54, 12:50, 13:45	Smith, G. C.	15:54	Turner, W.	15:58
Rinaldi, R. A.	11:54, 12:50, 13:44	Smith, K. J.	14:29	Umphlett, C. J.	11:57, 14:43
Ringle, D. A.	14:42	Smith, K. L., Jr.	15:54, 15:55	Ursomarso, B.	11:71
Riopel, J. L.	11:54, 12:51	Smith, M. H.	11:56, 12:51, 14:41, 15:31, 15:38, 15:47, 15:59, 15:60	Vandiviere, M. R.	12:53
Risinger, L. D.	15:51	Smith, D. C.	11:55	Van Fleet, D. S.	11:57, 13:47, 14:43
Ristanovic, B.	15:52	Smosky, J.	15:55	Van Hook, R. I., Jr.	15:57
Ritchie, J. C.	13:45	Snider, I.	11:54	Varma, B.	15:58
Rittenhouse, W. H.	14:33, 15:52	Sohmer, S. H.	13:46	Varner, J. B.	13:47
River, R. H.	15:52	Southall, R. M.	13:30	Veech, J. A.	14:44
Rizk, T. Y.	15:52	Spooner, J. D.	11:56, 15:55	Via, M.	14:35
Roberts, D. R.	15:53	Srivastava, B. I.	11:58	Wagner, C. K.	15:58
Robertson, R.	13:66	Stalter, R.	15:55	Wagner, F. W.	15:51
Robinson, E. S.	13:45	Standifer, L. C.	11:52	Waits, E. D.	13:47
Roeder, M.	11:54	Starkey, J.	15:83	Waldrep, M. J.	12:53
Roeder, R. H.	11:54	Stenroos, O. O.	13:46	Walker, A. T.	12:53, 13:47, 14:44
Rogers, H. J.	13:45, 14:39, 15:53	Stephens, P.	13:48	Walker, S. A.	13:47
		Stephens, R. E.	14:25, 15:55	Walter, R. H.	11:47
		Stern, D. H.	15:55	Ware, G.	11:58
		Stern, M. S.	15:55		

Warc, S. A.	14:44, 15:58	White, J. C., Jr.	13:29, 15:38, 15:59	Witherspoon, J. P.	14:46, 15:60
Warren, C. O.	14:44, 15:58	Whitford, L. A.	11:58, 12:54, 13:48, 14:45	Withers, J. D.	12:42, 15:60
Wass, M. L.	12:53	Whiting, P. W.	12:54, 13:48, 14:45, 15:59	Wofford, B. E.	15:60
Watson, J. R., Jr.	15:50	Whittier, D. P.	11:59, 13:48	Wolf, F. T.	13:49, 14:32, 15:8, 15:60, 15:61
Watts, J.	15:36	Wieand, K. L.	14:45	Wolfe, D. A.	14:27
Weatherspoon, C. P.	15:58	Wiles, E. L.	12:55	Wolff, S.	11:39
Webert, H. S.	11:52	Willard, W. K.	12:55	Woodmansee, R. A.	12:55, 13:49
Welch, A. S.	12:54, 13:48, 14:44	Williams, C. M.	11:59	Woolcott, W. S.	11:9, 12:52, 13:37, 14:46
Welch, B. E.	15:51	Williams, D. B.	11:59	Woolever, J. D.	11:87
Welch, B. L.	11:58, 12:54, 13:48, 14:44	Williams, I. H.	15:42	Wynn, G. G.	11:39
Welden, A. L.	11:58	Williams, L. S.	11:59	Wynn, R. A.	11:60
Wellband, W. A.	15:33	Williams, R. B.	11:59, 12:55, 13:48, 13:49, 15:59	Yarbrough, J. D.	11:60
Wells, C.	11:58, 13:42	Williams, R. G.	15:60	Yates, H. O.	13:49
Wells, J. R.	15:58	Willis, J. N.	12:45, 14:27	Yeats, F. T.	15:61
West, S. H.	11:55	Wilson, B. G.	14:45	Yeliger, M. B.	11:60
West, W. R., Jr.	11:9	Wimer, L. T.	12:55, 15:56, 15:60	Yerby, G.	11:57
Wharton, C. H.	12:54	Windler, D. R.	14:59	Yoshimura, I.	14:46
Whatley, B. T.	13:48, 14:45	Wise, B. H.	11:59	Zehr, M. V.	15:37
Whicker, M.	15:59			Zelickson, A. S.	14:38
Whigham, D.	15:59				

Geographical Distribution and Seasonal Incidence in the Helminth Parasites of the Starling, *Sturnus vulgaris* L. (Aves: Passeriformes: Sturnidae)

JAY D. HAIR, *Clemson University*

Seventy-five species of helminths, representing 49 genera, have been reported from starlings by numerous authors in different parts of the world. They comprise 26 species of Trematoda, 13 of Cestoda, 27 Nematoda, and nine Acanthocephala. In all instances except one, more genera and species of helminths have been reported from starlings from the eastern than from the western hemisphere. Several possible factors which may contribute to the differences between the helminth faunas of starlings from the two hemispheres are suggested.

The incidence of parasitism is high in starlings in western South Carolina during the spring and summer months. The prevalence and seasonal variations of the helminth parasites appear to be dependent on numerous factors which will be suggested.

(35)

Single Lobe Growth Patterns in *Parmelia caperata* (Lichens)

MASON E. HALE, *Smithsonian Institution*

The growth of a single lobe has been followed with closeup photography for one year. The dominant pattern is dichotomous branching with about one complete dichotomy each year. Lateral and intercalary growth is minor; most is strictly apical. During winter months growth rates are extremely low (of the order of 0.05 mm per week), but by April there is a rapid increase. The chief manifestation of growth is enlargement of the opaque white patches below the cortex which represent fungal tissue without associated algae. During rapid growth the fungal component grows faster than the algae, carrying along and enlarging the white patches. The patches decrease in size or close up during fall and winter as growth slows down.

(91)

Movements and Activity Patterns of the Dusky Salamander, *Desmognathus fuscus*

JAMES W. HARDIN¹, ROGER W. BARBOUR,
JAMES P. SCHAFER, AND MICHAEL J. HARVEY¹,
University of Kentucky

Movements and activity patterns of 14 *Desmognathus fuscus* were studied using radioisotope tagging and tracking techniques. The average home range size of 5 salamanders with 40 or more points of detection was 48.4 m² range, 25.2 m² to 114.5 m²). The maximum movement in a 24 hr period was 17.1 m (in 10 hr 25 min). Most recorded movements were of distances less than 2 m. Most movements began between 0600 and 0900 and between 2100 and 2400. The salamanders had peaks of activity at 0800 and 2300. The least activity was observed at 0300 and at 1600, average temperatures being 17.0°C and 29.0°C respectively. During and after rainfall the animals were often found out of the stream channel. In daylight wet periods the peaks of movement were exaggerated whereas in nighttime wet periods the movements were similar to nighttime dry periods. No sexual differences in activity were noted. The two most

active animals were a male and a female; the most quiescent were gravid females.

¹ Present address: Memphis State University.

(163)

Isozymes of the E_4 Esterase in *Zea mays*

JOHN W. HARRIS, *Tennessee Tech*

Five alleles of the E_4 esterase gene in maize have been found. Alleles E_4^c , E_4^d , E_4^e , and E_4^f each specify a series of isozymes with differing rates of anodal migration in starch gel electrophoresis at pH 8.5. The slowest band of each series is the most intense, with each faster band being progressively lower in intensity. The fifth allele, E_4^n , is a null or silent gene. The multiple bands specified by different E_4 alleles are distinguishable by the position to which the slowest band migrates in electrophoresis. However a number of the isozymes belonging to different series were found to correspond in migration rate. All of the bands in a particular E_4 series are specified by a single gene and the genes responsible for the production of different series are allelic. Several lines of evidence indicate that the various E_4 isozymes differ in charge.

(143)

The Effect of Fast Neutron Radiation and Light Intensity on Root-Shoot Ratios of *Liriodendron tulipifera* L. Seedlings

W. F. HARRIS

*Radiation Ecology Section, Health Physics Division
Oak Ridge National Laboratory, Oak Ridge, Tennessee*

Shoots of 2-year old yellow poplar were given acute sublethal fast neutron radiation doses of 200, 300 and 400 rads as dormancy was breaking. Plants were then grown in 100%, 50%, and 25% full sunlight. Three replicates of each treatment combination were harvested at 45, 75, 115 and 195 days post-irradiation. Root-shoot ratios (R/S) ranged from 0.85 (full sun-controls) to 0.23 (25% full sun-400 rads). At 45 and 75 days post-irradiation R/S values of irradiated seedlings were significantly lower ($P < 0.05$) than those of controls. Time (45 to 75 days) intensified the radiation effect. Reduced light intensity had little effect to this point. At 115 days radiation and reduced light both significantly lowered ($P < 0.05$) R/S values compared to radiation-treatment controls and full sun-grown plants. Reduced light resulted in R/S values similar to those of full sun-grown plants receiving 400 rads. Recovery (increased R/S value) of irradiated plants was more complete for 50% full sun-grown plants. Recovery was accelerated by a combination of increased lateral growth and reduced light intensity, increasing leaf area and photosynthate. Therefore, interactions of light intensities and ionizing radiation can play a significant role in determining R/S balances and subsequent growth and survival of plants.

(Research sponsored by the U.S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(108)

Home Range of the Eastern Mole, *Scalopus aquaticus*

MICHAEL J. HARVEY, *Memphis State University*
AND ROGER W. BARBOUR, *University of Kentucky*

Radioisotope tagging and tracing techniques were used in determining home ranges of seven eastern moles, four males and three females. Moles were tagged subcutaneously, using a hypodermic needle and plunger apparatus, with 50 microcurie Co⁶⁰ alloy wire tags. Detection apparatus consisted of a model 489 Thyac II survey meter equipped with earphones, shoulder strap, and a scintillation probe mounted at one end of a 3 m tubular aluminum pole. Each mole was located on at least 40 different days during periods ranging from 11 months to 3 years. The modified minimum area method was used for calculating home range areas. Average home range area was 7,433 m²; males averaged 10,898 m² (range, 3,616-18,041 m²), and females averaged 2,812 m² (range, 1,512-3,430 m²).

(69)

Growth Parameters and Notes on the Biology of *Bittacomorpha clavipes* (Fab.) (Insecta: Diptera: Ptychopteridae)

JOHN T. HAYES, *Savannah-River Ecology Laboratory*

The phantom crane fly, *Bittacomorpha clavipes* (Fab.) is a widely distributed species occurring in marshy areas adjacent to streams and ponds from Ontario to Manitoba south to Florida and Texas. In January, 1969, over 100 larvae of this species were collected from a small stream flowing from an artesian well on the Savannah River Plant, Aiken, South Carolina. A comparison of head capsule width with dry weight biomass of the individual larvae suggests four or perhaps five larval instars. Overwintering occurs in the larval stage which feeds on detritus and possibly *Spirogyra*. Adults are present from early spring until late fall, with peaks of abundance in June and October, at the Savannah River Plant.

(7)

Preliminary Studies of Nitrogen Fixation on a Granite Outcrop

J. ROBERT HERFORD AND JOE A. EDMISTEN
University of Georgia

The nitrogen budget of a granite outcrop is being studied by using a acetylene reduction test (Stewart et al, Proc. N.A.S. 58: 2071-2078, 1967) in modified form to test various outcrop components for nitrogen fixation ability. Plants and soils were collected, flushed of nitrogen, and exposed to acetylene in the field with sterile technique. The production of ethylene as a measure of nitrogen fixation ability was detected with gas chromatography. Outcrop plants shown to have the ability to reduce acetylene to ethylene include: *Andropogon virginicus*, *Vigueira Porteri*, *Tradescantia* sp., *Opuntia compressa*, *Smilax bona-nox*, *Rhus* sp., *Cheilanthes* sp., *Polytrichum* sp., *Grimmia* sp., *Cladonia* spp., *Parmelia* spp., *Peltigera* sp.

Color slides of the site and gas chromatographic results will be shown. Attempts are being made to quantitate the results in terms of potential nitrogen fixation per unit dry weight of plant tissue.

(8)

Isolating Mechanisms in the *Lupinus argenteus* Complex

LLOYD W. HESS, *Savannah River Ecology Laboratory*
AND
DAVID B. DUNN, *University of Missouri*

Extensive breeding studies, involving over 1,000 crosses, have indicated genetic compatability within this group of morphologically very similar taxa. Flowering season, pollinator selection, altitudinal stratification, geographic range, and habitat were considered along with the genetic isolation indicated by the breeding data. On the basis of this information and careful morphological comparisons over 75 named entities ranging from Canada to New Mexico were grouped into 12 named taxa which are believed to more truly represent the population biology of the group. A greatly reduced genetic plasticity of the higher elevation species was noted.

(158)

The Use of Neutron Activation Analysis in a Phylogenetic Study of Seed Mineral Content

LLOYD W. HESS, *Savannah River Ecology Laboratory*
AND
DAVID B. DUNN, *University of Missouri*

Neutron activation analysis is demonstrated to have numerous advantages over other techniques of mineral analysis; especially increased sensitivity, the non-destructive process, and reduced contamination potential. These traits are especially desirable for analysis of plant material such as seeds since the quantity is often very limited and the seeds themselves may be very small. Seeds representative of different species and subspecies of Lupines from various geographic locations were compared as to Mn, Na and K content. To give some idea of the variations of these three minerals in taxonomic units more distantly related than the individual species of a genus, seed material of nine families was also studied. In some cases the mineral content is indicated to be more related to site fertility than genetic difference while in certain families the ratio of minerals accumulated seems significant related within the taxonomic unit.

(76)

The Protozoa of Mammoth and Great Onyx Caves, Kentucky

RICHARD L. HOOVER AND STEPHEN M. GITTLESON
University of Kentucky

Thirty-one protozoan species were identified. Flagellates (15 species) are most common followed by amoebas (10) and ciliates (6). Great Onyx Cave contained *Atraktomonas laevis*, *Bodo variabilis*, *B. caudatus*, and *Heterophrys glabrescens*; Mammoth Cave: Historic Entrance — *Rhynchomonas nasuta*, *Sphaenochloris urceolata*, *Amoeba guttula*, *A. radiosa*, *Ciliophrys marina*; Richardson Spring — *Cyathomonas truncata*, *Polytoma minus*, *Bodo minimus*, *Atraktomonas laevis*, *Actinophrys sol*, *Raphidocystis infestans*, *Amoeba guttula*, *Vorticella microstoma*, *Colpoda* sp.; Fish tank (near Richardson Spring) — *Bodo globosus*, *Cercobodo crassicauda*, *Amoeba guttula*, *Colpoda steini*; River Styx — *Amoeba guttula*, *A. radiosa*, *Arcella vulgaris*, *Monas guttula*, *Codonoecca inclinata*, *Balladyna elongata*, *Astrodictylus radi-*

ans, *Peranema trichophorum*, *Polytoma minus*, *Phylomitus amylophagus*, *Raphidiophrys pallida*, *Bodo minus*, *Oxnerella maritima*, *Stichotricha intermedia*, *Euplotes charon*, *Colpoda steini*, *Heterophrys glabrescens*; Echo and Roaring Rivers — *Monas obliqua*, *Bodo caudatus*. Cave protozoa are troglophiles — surface forms that accidentally penetrate into the cave environment primarily via surface drainage where they live and reproduce.

(Research supported by the University of Kentucky Research Foundation.)

(39)

Biosynthesis of Thiamine by *Phycomyces blakesleeanus*

HOUSTON, M. R., I. McVEIGH, R. NEAL AND
W. N. PEARSON
Vanderbilt University

The biosynthesis of thiamine from hydroxymethylpyrimidine and C¹⁴-thiazole or C¹⁴-hydroxymethylpyrimidine and thiazole by *Phycomyces blakesleeanus* is described. Radioactive intermediate compounds and metabolites synthesized during growth in shake culture have been isolated and identified by one or more of the following techniques: thin layer chromatography, column chromatography, autoradiography, and bioautography. Data are presented which indicate that the pathway of synthesis of thiamine by this fungus is similar, if not identical, to that reported for baker's yeast and some species of bacteria.

(177a)*

(6)

Nitrogen Fixation in *Elaeagnus Umbellata*

KERMIT HUNNICUTT II AND JOE A. EDMISTEN
University of Georgia

Elaeagnus umbellata, a flowering, root-nodulated plant belonging to the family *Elaeagnaceae* was tested for its capability of fixing nitrogen. Root nodules of this woody shrub were tested for nitrogen fixing ability by the acetylene reduction test modified from Stewart, *et al.*, 1967. The production of ethylene from acetylene was detected by use of gas chromatographic technique. Results of these tests and data describing the distribution of *Elaeagnus* will be presented. *Elaeagnus umbellata* was found capable of fixing nitrogen and practical applications of this knowledge were considered.

(136)

Flavonoids and Systematics of American *Vernonia*: Compositae

GORDON E. HUNTER, KIM FREEMAN, BARBARA BURCH,
AND GUILLERMO FLORES
Tennessee Technological University

Flavonoid compounds isolated from methanol extracts of leaves of *Vernonia* species by paper chromatography are proving useful in the classification of the American species. Chromatographically the species are usually distinct. Further study of the compounds by means of spectrophotometry and acid hydrolysis can be used to characterize the flavonoid compounds. The latter information is providing documentation to support relationships suggested by morphological investigations of some of the populations.

* See page 73.

The six species included in this investigation are *Vernonia altissima* Nutt., *V. corymbosa* Schiv., *V. marginata* (Torr.) Raf., *V. lettermannii* Englem, *V. angustifolia* Michx., and *V. crinita* Raf.

(82)

A Survey of the Enteric Bacteria (Enterobacteriaceae) of Chelonians: Preliminary Findings

MARGUERITE M. JACKSON, MACDONALD FULTON,
AND CRAWFORD G. JACKSON, JR.
Mississippi State College for Women

A long-term investigation of the enteric bacterial flora of wild and captive turtles was initiated in early 1968. Individuals of 16 species, representing 2 families and 10 genera have so far been examined. Among wild individuals: *Salmonella miami* was found in *Sternotherus minor*; *S. infantis* in *Chelydra serpentina*; *Edwardsiella tarda* in *Chrysemys picta* and *Pseudemys s. scripta*; *Citrobacter* (Bethesda-Ballerup Group) in *Kinosternon subrubrum* and *Pseudemys floridana*. Among individuals which have been captive for one month to three years: *S. thompson* was found in *Pseudemys s. ornata*, *Geomyda annulata*, *Pseudemys nelsoni* and *Terrapene carolina bauri*; *E. tarda* in *P. s. ornata*, *G. annulata*, *P. nelsoni* and *Pseudemys concinna*; *Citrobacter* (Bethesda-Ballerup Group) in *T. c. bauri*, *C. picta*, *Kinosternon leucostomum* and *Gopherus polyphemus*. This report apparently constitutes the first finding of *Edwardsiella tarda* in turtles. Several strains of *Escherichia* and *Aerobacter* which may represent new species are concurrently being investigated. The widely distributed *Aeromonas hydrophila*, though not classified as a strict gut-inhabitant, was of frequent occurrence in both wild and captive individuals of most species examined.

Routine procedures and culture techniques are used to determine biochemical profiles prior to serotypic analysis. It is anticipated that the accumulating data will shed light on questions regarding incidence of infection, degree of pathogenicity and geographic distribution. (Supported in part by an MSCW Faculty Research Grant.)

(155)

The Reproductive Potential of *Drosophila Affinis*

WILLARD L. JINKS, Marshall University

Pertinent literature concerning the ecology and nutrition of *Drosophila*, and specifically *D. affinis*, has been briefly reviewed. Terminology relevant to the study of reproductive potential is redefined and clarified, with the term reproductive potential meaning any factor or the sum of all factors contributing to maximum population size, such as: sex ratio, longevity, fecundity, viability, and generation time. The methods of obtaining this information are outlined in detail.

The yeasts, *K. apiculata*, *S. cerevisiae*, and *P. fermentans* were used as food for the flies. Egg counts were made to obtain data on fecundity. The ratio of the imagoes to eggs gave information on viability. The time that it took for the egg to develop to the adult stage was considered to be the generation time. The female fly was permitted to live out its life cycle in a food vial and its expiration date was noted.

Longevity was notably different between the three yeasts; the life span was shortened considerably when flies ate *K. apiculata*, being only 14-22 days with an average of 14 days. *Pichia* and *Saccharomyces* averaged 34 and 22 days, respectively.

(110)

Winter Habitat Exploitation in Four Species of Sparrows in Ecotones

FRED L. JOHNS, *North Carolina State University*

An analysis of the habitat exploitation of four species of sparrows (Song, Field, White-throated Sparrow and Slate-colored Junco) in ecotones between "old fields" and woods was conducted in the Raleigh, N.C. region during the winters of 1966 and 1967. Data were collected as point observations of feeding birds in years, plots, vegetation zones, at heights from the ground, and in specific plants. Analyses of variation indicated that, even though all four species exploited similar volumes of space and time, there are demonstrable patterns for each species which negate the idea of mutual niche occupation in winter. Significant differences were found for species in vegetation zones, in heights from the ground, and in associated plant species but no differences were found for species in years or plots.

(184)

Myxidium chelonarum n. sp. (Cnidosporidia: Myxosporida: Myxidiidae) from Various North American Turtles

CHARLES A. JOHNSON, *North Carolina State University*

Myxidium chelonarum n. sp. is described from the gall bladder of *Pseudemys scripta scripta* (Schoepff) (Yellow-bellied Turtle) from Edenton, North Carolina. Trophozoite: green; round, flat; slightly ameboid; 16-180 microns in diameter; hyaline ectoplasm, granular endoplasm; polysporous. Spore: $14.2 \times 4.1 \times 3.7$ microns; boat shaped; suture lines indistinct; 4-6 striae arranged obliquely across spore; 2 polar capsules; polar filament 5-7 coils, averages 32 microns long. *Myxidium chelonarum* n. sp. was also found in the gall bladders of the following species of turtles: *Chelydra serpentina*, *Kinosternon sonoriense*, *Sternotherus odoratus*, *Gratemys pseudographica*, *G. pulchra*, *Pseudemys floridana*, *P. concinna*, *Chrysemys picta* and *Deirochelys reticularia*. Susceptibility studies involving eight species of vertebrates produced negative results.

(133)

Biosystematic Studies in *Vernonia* (Compositae)

SAMUEL B. JONES, JR., *University of Georgia*

The perennial species of *Vernonia* indigenous to eastern North America are especially promising materials for biosystematic studies; however, they have been the subject of relatively few biosystematic investigations. Our work has indicated the existence of hybridization, introgression, and clinal variation; species based by early taxonomists on one or two specimens, often with little or no ecological data; and the frequent naming of hybrids. The greatest problem is that of hybridization followed by introgression. This is sometimes confounded by the hybridization of more than two species. Partially sympatric species are often isolated by the relatively weak barriers of seasonal or ecological isolating mechanisms. Man has frequently helped to break down this isolation by creating disturbed ecological sites which are now occupied by hybrid populations. Our approaches to clarification of some of the problems include a hybridization program, a cytological study, an analysis of population samples, and observations of some of the ecological parameters of the populations.

(13)

Pesticide Flow Through a Model Freshwater Ecosystem

JEROME KELLY AND MORRIS F. CRANMER
*Environmental Biology Program, University of Miami,
and Pesticide Research Laboratory, USPHS,
Perrine, Florida*

Chlorinated hydrocarbon pesticides have been found to be concentrated upward in food chains in estuarine environments. Since pesticides are often washed from fields on which they were applied into bodies of freshwater, they are found in freshwater organisms, sometimes causing serious damage to the environment. In this study a 110 gallon tank, simulating natural conditions, was stocked with carnivorous fish, herbivorous fish, a plankton population, higher plants, and detritus feeders. A concentration of DDT of 1 ppb was maintained in the tank water. At selected times organisms from the various trophic levels, the water and substrate materials were analyzed for DDT and its breakdown products by gas chromatography. Results are discussed in terms of DDT uptake and its ecological consequences.

(14)

Pesticide Residues in a South Floridian Agricultural District Canal

JEROME KELLY, PETER RHOADS, DOUGLAS SCHNEIDER,
AND RICHARD SMITH
Environmental Biology Program, University of Miami

South Dade County, Florida, contains farm lands to which large amounts of pesticides are applied. Unknown amounts of these pesticides find their way into the nearby drainage canals. A study of the pesticide levels in one of these canals was made during the winter growing season (1968-69), the season of heaviest use of the fields, particularly for truck farming. The canal, C-102, and nearby fields were surveyed for drainage runoff and land use by ground observations and aerial photography. The Central and Southern Florida Flood Control District office supplied information concerning drainage flow. Surveys of crop distribution and pesticide sales provided information on types of materials applied to the agricultural crops. Water samples, collected along the length of the canal, were analyzed by gas chromatography. Seven pesticides, identified as persisting throughout the length of the canal, were estimated quantitatively. Sampling will continue through March, 1969. Data will be reported on aquatic pesticide levels and correlated with pesticide application, type of crop, rainfall, and canal flow.

(Supported by U.S. Public Health Service Training grant No. ES-00126.)

(34)

Antennopsis gallica Heim and Buchli, (Hyphomycetes: Gloeohaustoriales), An Entomogenous Fungus on Subterranean Termites in Florida

J. W. KIMBROUGH, *University of Florida*

Antennopsis gallica Heim and Buchli, an entomogenous Hyphomycete, is reported for the first time in North America on the subterranean termites *Reticulitermes vir-*

ginicus Banks and *Reticulitermes flavipes* (Kollar) in north Florida. This also constitutes the first report of this fungus on species of *Reticulitermes*. Although the fungus has been reported on various termites in certain European countries, many aspects of its life cycle were heretofore unknown. Details of the life cycle of *A. gallica* are described and illustrated and methods of distribution are discussed. These studies have shown that although infection is widespread in this area, the degree of infection of individual insects is less than reported in other parts of the world.

(63)

Age Difference as a Factor in the Assay of the Effect of 5-HT on Gut Motility in the Rat

T. DANIEL KIMBROUGH
Virginia Commonwealth University

Work during the past six years has shown that the rat duodenum when perfused *in vitro*, is a sensitive tissue indicator of 5-hydroxytryptamine. Drug treatment and fluorometry were used to show that peristalsis increases in response to elevated levels of 5-HT. These studies, however, have failed to consider possible variations owing to age. An assay of this factor would seem essential to a long-term study of 5-HT metabolism since certain brain tissues *e.g.* pineal, or tissues which contain the highest levels of 5-HT, also show marked changes with age.

Recently, gut strips from male Wistar rats were perfused, and their contractions were recorded with a GME polygraph. Mean results indicated that 5-HT-induced gut motility is up to 300% greater in 5 months old rats than in 1½ month old rats.

(81)

Rotifers (Rotifera) of Four Flood Control Reservoirs in Northern Mississippi

LUTHER A. KNIGHT, JR., AND Y. J. MCGAHA
University of Mississippi

The rotifer fauna of four flood control reservoirs in northern Mississippi was investigated from June, 1965 through April, 1968. Data from 34 stations on Arkabutla, Sardis, Enid and Grenada Reservoirs and some of their tributaries include 85 species of rotifers. Emphasis was placed upon those forms occurring in streams and limnetic zones of the reservoirs. Although rotifers are a major component of zooplankton, only a few species occurred with adequate frequency and in sufficient numbers to be considered common. However, members of *Polyarthra dissimulans* Nipkow and *Keratella cochlearis* (Gosse) often constituted a majority of the zooplankton crops. Percentages of zooplankton represented by rotifers ranged from 16.3% in some streams to 85.1% in bays. Populations of rotifers were sparse in streams, but development reached maxima in bays where stream and reservoir waters mixed and then decreased in the main bodies of the reservoirs. Poor quality of water in these reservoirs may limit populations of many rotifers.

(42)

Further Aspects of Flagellar Retraction in Fungi

WILLIAM J. KOCH
University of North Carolina at Chapel Hill

Of the four basic patterns of flagellar retraction recently demonstrated, one of these, *body-twist* retraction, is analyzed further. Observing zoospores of *Blastocladiella* with phase contrast microscopy, demonstrated are the movements of the zoospore's body and flagellum prior to encystment. A three-dimensional concept of *body-twist* flagellar retraction is presented. Also shown is the fate of the nuclear cap during encystment.

(171)

The Effects of Alkyl Benzene Sulfonate (ABS) and Linear Alkylate Sulfonate (LAS) at Three Concentrations on the Respiration Rate of *Notropis Lutipinnis* Jordan and Brayton

WAYNE LASLIE, Georgia State College

The effects of alkyl benzene sulfonate (ABS) and linear alkylate sulfonate (LAS) at 10, 20, and 30 ppm on the respiration rate (in gill movements per minute) of *Notropis lutipinnis*, a teleost fish of the Order Cypriniformes, were tested. A concentration of 10 ppm of LAS produced no significant differences in the respiration rate of the test fish from that of the control, while 10 ppm of ABS produced a significant difference at the .05 level. In 20 ppm the respiration rate was increased. The differences in the respiration rate of the experimental fish and that of the controls were significant at the .01 level. At 30 ppm the respiration rate was decreased and the differences were significant at the .01 level.

ABS appeared more toxic than LAS with 10% (2 out of 20) of those exposed to 20 ppm of this solution dying, while 15% (3 out of 20) died in 30 ppm of ABS. None died in the LAS solution. There was no significant difference in the respiration rates of the fish in LAS and those in ABS at a given concentration. The effects of the solutions appeared to be cumulative as the respiration rates of the controls steadily increased throughout the experiment.

(33)

A Floristic Study in Mobile, Alabama

MICHEL G. LELONG, University of South Alabama

The need for a recent and reasonably complete list of vascular plants in the Mobile region has been felt in the teaching of some of our biology courses. Consequently a vegetational study of the area surrounding the University of South Alabama campus was conducted during the last two years. This area covers approximately three sections of land and consists primarily of rolling, sandy Longleaf pine woods typical of this region. It is traversed by Three Mile Creek and its swampy and marshy floodplain.

Approximately 2600 specimens were collected and identified. They represent 684 species and varieties of vascular plants. The grass family is best represented in this location with 111 species, followed by the composite family with 86 species, the legume family with 59 species, and the sedge family with 42 species.

(46)

Interconnections Between Cytoplasmic Microtubules and Basal Bodies of Tetrastoralean Pseudocilia (Chlorophyta, Chlorophyceae, Tetrastorales)

CAROLE A. LEMBI AND PATRICIA L. WALNE
University of Tennessee

Ultrastructural investigations of the development and structure of pseudocilia in *Tetrastora lubrica* and *Schizochlamys* sp. have disclosed interconnections between cytoplasmic microtubules and pseudocilial basal bodies heretofore unreported. Connections between elements of the basal bodies and the proximal connecting fibers will also be described. The possible significance of the interconnections in correlating structure and function of these organelles will be discussed.

(Research supported in part by an NDEA Title IV Predoctoral Fellowship to the senior author and by a University of Tennessee Faculty Research Grant to the junior author.)

(124)

Pines in the Vegetation of the Marshall Forest

E. LEWIS LIPPS, *Shorter College*
H. R. DESELM, *University of Tennessee*

The plot method was used to examine the forest vegetation of Georgia's first National Natural Landmark — the 100-acre Marshall Forest. Pine was important in each of the three plant communities: Pine-Oak on the gentle, south-facing slope, Chestnut-Oak on the upper north-facing slope, and the Mixed Forest of the ravine.

The relation of pine density and size to soil impedance to roots and periodic storms is discussed.

(135)

A Consideration of the Systematic Position of *Phryma*

HARRIETT LIPSCOMB, *Georgia College at Milledgeville*

Phryma, a monotypic genus with uncertain taxonomic affinities, was investigated anatomically and morphologically in an effort to determine its systematic position. A general survey was made of the families in Scrophulariales and Lamiales with which *Phryma* has been associated. Of the groups examined *Phryma* exhibits the most structural similarities with the racemose Verbenaceae in general vegetative form, inflorescence type, and in floral and fruit anatomy. Detailed observations of the floral and fruit anatomy reveal that *Phryma* has its closest affinities with the tribe Lantaneae in the subfamily Verbenoideae. Even though similar in fruit and floral characteristics, *Phryma* has diagnostic and distinct features separating it from the tribe Lantaneae. Because of the compatible features of *Phryma* with the members of the subfamily Verbenoideae, it is suggested that *Phryma* be accorded tribal status in the subfamily Verbenoideae of the family Verbenaceae.

(175)

A Study of Multiple Molecular Forms of Enzymes in Species of Salmonidae and Esocidae (Osteichthyes: Clupeiformes)

NICHOLAS J. LO CASCIO
State University College at Buffalo

A starch gel electrophoretic study of the enzyme glucose-6-phosphate dehydrogenase (G-6-PD) in the Salmonidae and the enzyme 6-phospho-gluconate dehydrogenase (6-PGD) in the Salmonidae and Esocidae was undertaken in order to deduce the molecular structure and genetic variability found within and between species of these families for these two enzymes. An examination of the banding patterns of G-6-PD and 6-PGD from *Salmo gairdneri* (RT), *Salmo trutta* (BT), *Salvelinus fontinalis* (ST) and *Salvelinus namaycush* (LT) liver samples did not demonstrate intraspecific variation. Difference between species was clearly evident. Only when an electrophoretic examination was made of two groups of Brown Trout during spawning season was a sex difference noted in the G-6-PD and 6-PGD banding patterns. This was interpreted as the effect of hormonal influence. The 6-PGD enzyme found within the species of Esocidae and Salmonidae examined was found to be polymorphic and dimeric in structure. This polymorphism is controlled genetically by a single locus.

(78)

Additions to the Distribution of *Cura foremani* (Girard, 1852) in the Eastern United States

WILLIAM D. LONGEST, *The University of Mississippi*

Cura foremani (Girard, 1852), the common brown planarian, formerly reported from Rhode Island westward to Michigan and south into Tennessee and Virginia, occurs in Maine, Mississippi and Louisiana. The worms prefer clear streams and springs that seem to be free of pollution. In some streams and springs *Cura foremani* is the only triclad inhabitant, however, it does exist in some streams with *Dugesia tigrina*.

(57)

Glycerol Ether Content of Five Species of Insects

ROGER H. LUMB, *Western Carolina University*

Since their discovery in tumors, glycerol ethers have become the subject of rather intensive investigation. Success in discovering the precursors of these compounds in mammalian tissue has been limited; this laboratory is attempting to use insects as a simple model system for studying glycerol ether metabolism. A brief survey of several insects as to glycerol ether content has been done as preliminary work to such studies.

Sarcophaga bullata (larvae, pupae, and adults), *Apis mellifera* (larvae and adults), *Gallaria* (larvae), *Photinus pyralis* (adults), *Phormia regina* (larvae, pupae, and adults) were used for this study. Only *Photinus* was found to contain a substantial amount of alkyl glycerol ether, and none of the insects studied contained significant amounts of alk-1-enyl glycerol ether. Relative percentages of neutral and phospholipid fractions and chain-lengths of the alkyl glycerol ether in *Photinus* are reported. This work done in the Lipid Research Laboratories, Medical Division, Oak Ridge Associated Universities, Oak Ridge, Tennessee. Supported in part by USAEC.

(53)

Ultrastructural Studies From a Free Living Juvenile Form of *Rhabdias ranae*, Walton 1929

LEONARD E. LUNDQUIST AND FELIX H. LAUTER
University of South Carolina
WILLIAM G. DOUGERTY AND MARY M. LEE
Medical College of South Carolina

The Ultrastructure of the intestinal cells from *Rhabdias ranae* was studied. Major interest was centered on the luminal border of the cells since there have been reports of cilia lining the gut of some nematodes. Electron micrographs showed microvilli to be present on the luminal surface of the cells. The microvilli are covered by a homogenous extracellular coating. In contrast to the rest of the cells, the three most anterior cells of the intestine are devoid of microvilli. Their luminal border is smooth and covered by a cuticle. This complex of cells make up the esophago-intestinal valve. The cell organelles were studied. In addition, inclusions were observed and their location in relation to organelles considered. Special emphasis was placed on multilaminated bodies which were found in the mitochondria.

(127)

Concentrations of Zinc, Copper, Manganese, Molybdenum, and Boron in Plankton Samples from Selected Stations of Mobile Bay

MICHAEL A. MAGNOLI, *Marine Science Institute, University of Alabama, Bayou La Batre, Alabama 36509*

Water, plankton, and periphyton samples collected at weekly intervals from May, 1968 to January, 1969, from five representative stations of Mobile Bay displayed wide fluctuations in trace metal content from analyses using the atomic absorption technique. Maximum concentrations were correlated with high concentrations of suspended organic matter, being in highest concentration during periods of plankton blooms.

(41)

A Study of Aflatoxin Production by Isolates of *Aspergillus flavus* from West Pakistanian Soils

WALTER WM. MANIGAULT, LAFAYETTE FREDERICK
AND THOMAS W. COLE, JR.
Atlanta University

Seven isolates of *Aspergillus flavus*, isolated from West Pakistanian soil, were analyzed to determine their aflatoxin producing capacities. The isolates were cultured on rice, shredded wheat chex, and a semi-synthetic liquid medium. Fermented cultures were extracted and the partially purified chloroform extracts were analyzed by thin-layer chromatography for aflatoxins B₁, B₂, G₁, or G₂. Determinations were made by comparing the chromatograms of each isolate with that of a known standard. Aflatoxins levels were first determined by comparing fluorescence intensity of any aflatoxin resolved with that of a standard. Quantitative determinations of B₁ concentrations in the purified rice extracts were made by ultra-violet absorption spectrophotometry.

Thin-layer chromatographic analyses indicated that B₁ was produced by all seven isolates, although levels of B₁ varied sharply. Aflatoxin B₂ was produced by the five isolates that were high B₁ producers, but was not detected in extracts from the two low producers. No clear evidence of the presence of G₁ or G₂ in extracts of the

isolates was provided. Aflatoxin G₁ was suspected, however, in one of the high level B₁ producing isolates. These studies provide further evidence of the widespread occurrence of aflatoxin producing fungi in soils throughout the world.

(Research supported by Agricultural Research Service Cooperative Research Contract No. 12-14-100-8390 (34), U.S. Department of Agriculture.)

(151)

Radiation Effect on Starch Metabolism in Wheat Seedlings

MANSURI, A. D., BIBB, D. B. AND KELLY, D. J.
Bennett College

The effect of ionizing radiation on starch metabolism in endosperm has been compared with that in control plants. Irradiated (20,000 r dosage) as well as control seeds were grown on a thin layer of sterilized sand in Petri dishes and starch content was determined spectrophotometrically at well marked germination stages.

Rate of starch hydrolysis is slower in irradiated seedlings as compared to the rate in control seedlings. This slower rate of hydrolysis in irradiated seedlings continues for 120 hours of germination and increases 6-fold at 144 hours of germination and suddenly declines at 168 hours of germination; whereas in control seedlings a steady rate of hydrolysis is maintained. The disturbed rate of starch utilization due to ionizing radiation may be one of the factors in abnormal and stunted growth of the seedlings.

(169)

Rapid Histological Preparation of Chitinous Specimens

IOLA T. MCCLURKIN AND ROBERT D. RIETHER
University of Mississippi

At temperatures between 46 and 60 C., chitinous specimens are fixed and softened within twenty-four hours in the following solution: saturated picric acid in 90% isopropyl alcohol — 75 parts, formalin — 15 parts, and concentrated nitric acid — 8 parts.

Dehydration, clearing and embedding are all done at 55 C. Following four hours dehydration in 100% isopropyl alcohol, specimens are cleared overnight in terpenol and embedded in Paraplast. Continuous paraffin ribbons may be obtained as thin as five microns.

(125)

Experimental Analysis of Community Structure

J. FRANK MCCORMICK, FAIRMAN CUMMING,
CLAIR MELLINGER AND REBECCA SHARITZ
University of North Carolina

The structure of any system is largely determined by the distribution, abundance, variety, and morphology of its components. Ecological studies of natural communities routinely include descriptions of these parameters and usually conclude with hypotheses concerning the mechanisms and factors responsible for structural qualities. These hypotheses are rarely tested experimentally. Seldom do community ecologists verify cause and effect relationships prior to accepting hypotheses as fact. Island communities of Southeastern granite outcrops, because of their structural simplicity, provided an opportunity to experimentally test a hypothesis based upon field observations of dominant species. The hypothesis

that soil depth and soil moisture are the chief variables influencing the structure of outcrop communities was verified experimentally by randomizing the influence of other variables in tests for cause and effect relationships between community structure and these two environmental factors.

(12)

An Unusual Habitat for *Stemonitis splendens* (Myxomycetes)

JAMES C. McDONALD, *Wake Forest University*

Several myxomycetes and their interesting habitats are discussed.

(71)

The Genus *Mesosoma* Weed (Phalangida, Arachnida) of North America

CHARLES R. MCGHEE, *Virginia Polytechnic Institute*

The genus *Mesosoma* Weed has attracted little attention. Species appear to be confined to the southeastern and midwestern sections of the United States. The four species which can be recognized as belonging to the genus are *Mesosoma nigrum* (Say) Weed, *M. coxatum* Davis, *M. roeweri* Goodnight, and *M. texana* Goodnight. These species are based on rather incomplete descriptions which for the most part would not permit their identification with any degree of certainty. An attempt has been made to redefine the known species of the genus. This will perhaps clear the way for a more comprehensive systematic study of the group and will contribute to future research into their distribution and natural history.

(111)

Ornithological Education in Southeastern Colleges and Universities

ROBERT W. MCGOWAN, *Memphis State University*

There are 266 four-year colleges and universities in 14 southeastern states (including Texas). Questionnaires were sent to the 60 schools where Ornithology is taught. Forty-three were returned. These questionnaires determined the average number of students studying ornithology each year, the texts, laboratory manuals, and field guides most frequently used, the extent of field experiences in undergraduate courses, the experiences by students in preparing bird skins, and the number of advanced degrees offered annually in ornithology. Also, from the questionnaires, a directory of teachers of Ornithology in the southeast was prepared.

(107)

An Investigation of the Fishes of the Wolf River in Tennessee and Mississippi

DENNIS W. MEDFORD AND BILL A. SIMCO
Memphis State University

The Wolf River in Tennessee and Mississippi was studied between July 18, 1967, and July 13, 1968. The species of fish present and the habitat in which they were collected were recorded for 73 collections from 48 stations. Fifty-three species of fish were obtained in this study.

(126)

Phyto-Geographical and Ecological Studies in Malesia

WILLEM MEIJER, *University of Kentucky*

A cursory summary is given of plant explorations, geography, and ecology in Malesia during the past 20 years. The great potential for further field work is emphasized. Monographic studies for the Flora Malesiana are revealing new genera, range extensions of unexpected species, and enormous richness of species in some genera. The need for study of plants in the field instead of just herbarium specimens is becoming obvious. Palynological research of deposits from the Cretaceous onwards and recent mapping work of plant areas have given new insights into the possible role of Malesia in the evolution of flowering plants and their dispersal over the earth.

The role that plant exploration can play in forest exploitation and management, land-area planning, and improvement of crops is mentioned. Intensive ecological research in forestry and agriculture in Malesia is urgently needed and should play an important role in any technical assistance for the economic development of this area. Various aspects of the author's studies and travels in Sumatra and Borneo will be illustrated with a series of colored slides and black and white transparencies.

(185)

Helminths of the Opossum (*Didelphis virginiana*) in North Carolina

GROVER C. MILLER AND REINARD HARKEMA
North Carolina State University

Studies were conducted on the incidence and distribution of helminths in 54 opossums from 13 counties in eastern North Carolina. Most of the hosts were collected in the vicinity of Raleigh, N. C., but some were taken from coastal counties. Thirteen species of helminths were recovered as follows: TREMATODA: 4 species; CESTODA: 1 species; ACANTHOCEPHALA: 1 species; NEMATODA: 7 species. All hosts evidenced some degree of infection and the parasites recovered were those which seem to be fairly specific for the opossum throughout its range.

(2)

Nitrogen Fixing Ability of *Caenothus americanus*

MERCER D. MILLER AND JOE A. EDMISTEN
University of Georgia

Delwiche, Zinke, and Johnson (1965) confirmed the ability of various West Coast species of *Caenothus*, a flowering, root-nodulated, non-legume, to fix nitrogen by the $^{15}\text{N}_2$ technique. *Caenothus americanus*, a small flowering shrub found in drywoods and on hillsides of the Eastern United States, was tested for the capability of nitrogen fixation by the acetylene reduction technique (Stewart, Fitzgerald, and Burris, 1967). Results indicated the capability of root nodules of *C. americanus* to fix nitrogen. Attempts are being made to quantitate the data from the acetylene reduction tests. The ecological significance of *C. americanus* in relation to its nitrogen fixing ability and the practical value of the acetylene reduction technique will be discussed.

(80)

A Study of the Bottom Fauna of Sardis Reservoir in Relation to Biological Productivity

TROY MILLICAN AND Y. J. MCGAHA
University of Mississippi

Sampling of benthic organisms was made on a bi-monthly to monthly basis from July 3, 1967, to May 27, 1968, on Sardis Reservoir. Samples were taken with Ekman dredges and represented nine regular sampling stations and five transects consisting of four stations each. Each sample comprised approximately five square feet.

Representatives of three Metazoan phyla, totaling 13 genera, of which five appeared most prevalent, were collected. The numerical distribution of organisms was: Chironomids, 42% collected at all stations; *Chaoborus*, 24% collected at all stations; Tubificids, 23% collected at 13 stations; Sphaeriidae, 5.9% collected at 11 stations; *Hexagenia* nymphs, 3.1% collected at 8 stations. Chironomids were the dominant organisms in terms of mass. Bay areas appeared to be the most productive in contrast to the open water areas. Sampling sites with mud type bottoms supported the largest number and kinds of benthic organisms. Water level fluctuation, bottom type, erosion material, and predators are factors influencing the benthic productivity in Sardis Reservoir.

(162)

Effect of Continuous Exposure to Two Insecticides on the Fitness of Two Third Chromosome Inversions of *Drosophila pseudoobscura* (Insecta: Diptera)

ROBERT E. MOISAND AND JOHN M. CARPENTER
State University College at Buffalo and
University of Kentucky

The effect of continuous exposure to various concentrations of DDT and Guthion on the relative fitness of two third chromosome inversions of *Drosophila pseudoobscura* were studied. Relative fitness, as indicated by the frequency of the two inversion chromosomes in the control and insecticide stressed populations, was compared to the frequencies predicted by the Hardy-Weinberg formula.

(24)

The Influence of Different Mounting Techniques on the Size and Shape of Pollen Grains of *Solidago boottii* (Asteraceae, Asterales, Angiospermae)

GARY H. MORTON, University of Tennessee

Studies of elliptical pollen grains in *S. boottii* were made to evaluate current methods of pollen examination and measurement. Fresh and dried pollen grains were measured without treatment or mounting medium. The dried pollen was considered as the standard for shape and size. Measurements of pollen mounted by different current techniques were compared to the standard. Depending on the technique used, the pollen remained the same size and shape as the standard, changed in size, or changed in shape and size. A summary of the results and their application to taxonomy will be discussed.

(156)

The Inheritance of Sinistrality in *Partula suturalis* (Gastropoda, Stylommatophora)

JAMES MURRAY, University of Virginia
AND

BRYAN CLARKE, University of Edinburgh

Partula suturalis Pfeiffer, a land snail from Moorea in the Society Islands, is unusual in that dextral and sinistral individuals are found within a single species. Local populations may consist of either left or right-handed forms or of both. Laboratory breeding has produced lineages which encompass four generations. Since *P. suturalis* is hermaphroditic and normally reproduces by cross-fertilization, separate progenies may be obtained for each animal in a pair. Usually each individual produces offspring with only one type of coiling, which may be the same as or different from its own. The lineages indicate that the direction of coil of the offspring is controlled by the genotype of the maternal parent. Thus Mendelian segregation occurs, but its expression is delayed for one generation. In this respect it resembles *Limnaea peregra* (Boycott and Diver 1923), although in *P. suturalis* sinistrality is dominant. Exceptions to these rules will be discussed.

(65)

Changes in Rat Protein Patterns Under Combinations of Fasting and Electric Shock

F. KIRK NELSON, Memphis State University

Rats were subjected to experimental conditions of fasting, electric shock, and combinations of these stimuli. Determinations by acetate membrane electrophoresis indicated that albumin levels were decreased in all cases tested, and the globulins were slightly increased. The gamma-globulin fraction was found to have the greatest increase under fasting conditions. A slightly higher deviation from the normal condition was observed in females under stressful situations.

(139)

Apomictic Species and Species Complexes in s.w. U.S. *Erigeron* Section of *Olygotrichium* (Asteraceae)

GUY L. NESOM
University of North Carolina at Chapel Hill

This project was initiated to determine the relationship between *Erigeron flagellaris* Gray, a small, stoloniferous and aggressive species widespread in the s.w. U.S. (plus a small disjunct area in British Columbia), and a complex of three very narrowly and closely related species of southwestern Utah. One of these was recognized by Cronquist as a variety of *E. flagellaris* and suggested as perhaps the parental form of *E. sionis*, another of the three endemics. However, this varietal status has proved not to be the case, the so-called variety actually being a highly variable diploid and occurring with a pentaploid form of the true *E. flagellaris*. Hexaploid, tetraploid, and triploid populations of *E. flagellaris* also occur in this area and are all apomictic; the diploids are restricted to a small area in central Colorado. Preliminary evidence suggests that these levels are formed primarily intra-populationally rather than through segmental allopolyploidy. The Utah endemics and *E. divergens*, another closely related species, also possess diploids plus several apomictic levels of ploidy.

(44)

Observations on the Distribution of Certain Aquatic Phycomycetes in Granite Outcrop Soil

MARGARET GREEN NESOM, *University of North Carolina*

In April and June, 1968, the distribution of selected members of Phlyctidiaceae, Blastocladiaceae, and Saprolegniaceae in the upper 2.5 cm of soil was studied in an island community on a granite outcrop near Atlanta, Georgia. A selective baiting technique was used to eliminate competition for substrate by non-zoosporic forms. Of the numerous taxa of Phlyctidiaceae observed, four easily recognized species were studied: *Rhizophydium echinocystoides*, *Septosperma rhizophidii*, *Phlyctochytrium aureliae* and "Blyttiomycetes", an undescribed fungus possibly allied to the genus *Blyttiomycetes*. Filamentous fungi studied include *Allomyces neo-moniliformis* (Blastocladiaceae), *Achlya klebsiana*, and *Leptolegnia* sp. (Saprolegniaceae). Soil moisture, temperature, organic content and presence of other plants were recorded for each of 169 soil samples. General edaphic characteristics of the community, pH and soil texture, were determined for the upper soil at locations of increasing soil depth. A partial description was presented of the immediate environmental complex surrounding viable structures of the aquatic phycomycetes listed.

(18)

The Measurement of Vascular Plant Species Diversity in an Oak-hickory Community in the Piedmont of Georgia

STUART A. NICHOLSON, CARL D. MONK, AND
GEORGE L. CHILD, *University of Georgia*

Most species diversity studies have centered on groups of organisms of similar size (i.e. insects, trees, birds) and have been based on data collected using the same census method and uniform plot size. In communities such as forests several different plot sizes and sample methods are often used to census the various strata. Two questions arise: (1) how sample plot size and method effects diversity within a stratum, and (2) how data from different strata can be pooled to estimate the diversity of the community. Strata of an oak-hickory forest were arbitrarily defined as follows: (1) ground flora, woody stems < 1 ft. tall and all herbaceous stems; (2) shrubs, woody stems > 1 ft. tall but < 1 inch D.B.H.; (3) understory, stems > 1 < 4 inches D.B.H.; and (4) canopy, stems > inches D.B.H. The forest was divided into two halves which were sampled in the following manner: ground flora by forty by 1 sq. m. quadrats; shrubs, twenty 16 sq. m. quadrats; understory and canopy by five 2000 sq. m. quadrats, twenty 100 sq. m. quadrats, and 40 quarter points. The three sampling techniques used for canopy and understory yielded similar estimates of diversity expressed by the function $\bar{H} = -\sum p_i \ln p_i$, suggesting that diversity is independent of sampling method and plot size, providing an adequate sample is obtained. The community diversity was determined by pooling the data that was required to estimate the diversity of each stratum. The estimated diversity values for the strata and community determined from the two independent sets of data were comparable.

(64)

The Effect of Light Jogging on Cardiovascular Fitness

DONALD A. OLEWINE AND FRANK H. RAMSEY
Georgia Southern College

Recently jogging programs have been recommended for improving the physical fitness of the general population. The following experiment was undertaken to determine the effects of light jogging on cardiovascular fitness, as indicated by the Harvard Step Test, in 38 male freshmen students who participated in the program as part of their physical education requirement. During 3 training sessions/week the participants alternately walked and jogged at 110 yard intervals around an irregularly shaped ½ mile course. At the first training session a distance of 1½ miles was completed by each participant. Each week the distance increased by ½ mile until 3 miles were completed at each session during weeks 5 through 9. The results of step tests (mean $\pm$ S.E.) administered in the first, fifth, and 10th weeks were not significantly different (72.6 ± 0.2 , 71.3 ± 2.6 , and 73.3 ± 2.4 respectively). However, the mean resting heart rate (beats/30 seconds) was significantly lower at the 10th week than it was at the beginning of the training period (39.8 ± 1.3 v.s. 43.0 ± 0.08 , mean $\pm$ S.E.). Supported by grant-in-aid from the Georgia Southern College Faculty Research Fund.)

(179)

Parasites of the Tree Squirrels of Southwest Tennessee

WILLIAM A. OLEXIK, A. E. PERRY, AND W. E. WILHELM
Memphis State Univ.

Ten species of parasites were recovered from 50 tree squirrels of southwestern Tennessee, and several of these are new parasite records for the host genus *Sciurus* (Mammalia, Rodentia). *Orchopeas howardii* (Insecta, Siphonaptera), a squirrel flea, was the only ectoparasite collected. *Hymenolepis nana* and an unidentifiable species of Diphyllbothriidae are new cestode records from tree squirrels (Cyclophyllidae and Pseudophyllidae). *Hymenolepis nana* was an erratic infection as the adult was encysted on the ventral lobe of the host liver. *Nudacotyle* sp. (Trematoda, Digenea) is a new record from *Sciurus* and appears to be the first trematode reported from squirrels. *Heligmosomum* sp., *Citellinema sleggsi*, (both Strongylidae) *Strongyloides* sp. (Rhabdiasidae), *Capillaria* sp. (Trichuridae), *Rictularia* sp. (Spiruridae), and a species of the subfamily Trichostrongylinae (Strongylidae) were nematode parasites. *Heligmosomum* sp. is a new report. Sites of infection, numbers of parasites recovered, and sex ratios of nematode parasites are reported.

(89)

Some Salamanders from Western North Carolina and Adjoining Areas (AMPHIBIA, Urodela)

L. M. OUTTEN, *Mars Hill College*

During the period from the early part of 1967 through 1968, more than one hundred field studies and collections of salamanders were made in areas from the Cades Cove and Clingmans Dome sections of Great Smoky Mountains National Park to the regions of Craggy Gardens, Mount Mitchell, Grandfather Mountain, Roan Mountain, and Mount Jefferson. Field observations were followed by further study in the laboratory.

(54)

Ultrastructural Aspects of Senescence in *Euglena granulata* with Special Reference to the Eyespot (Euglenophyceae, Euglenales)

JOHN R. PALISANO AND PATRICIA L. WALNE
University of Tennessee

Cells of *Euglena granulata* were grown in an enriched liquid medium of soil-water supernatant and Bold's Basal Medium with vitamins and were allowed to age over a period of weeks. During the course of senescence, cells change progressively from green, actively motile and highly metabolic naked organisms to chlorotic, less active to non-motile, encapsulated cells. Morphological and positional changes, possibly associated with senescence, in cellular organelles will be described. The structure, integrity, and position of eyespot components will be compared with those of other pigment-containing bodies which accumulate in the cell as it senesces.

(Research supported in part by a University of Tennessee Biomedical Sciences Support Grant, 1101R-01, to the junior author.)

(148)

Seed Germination Studies of Horse Nettle, *Solanum carolinense* L.

DAVID J. PARRISH, *Wake Forest University*

Laboratory investigations of the requirements for seed germination of *Solanum carolinense* are revealing several regulatory parameters. There is a demonstrable dormancy exhibited by mature seeds. Seeds which are 80% to 90% viable are non-germinable on moist filter paper. Aqueous extracts of the fruit contain an unidentified inhibitor or inhibitors. Inhibition of lettuce seedling growth is apparent at dilutions of 100 ppm. Exogenously applied auxin, gibberellin, and kinetin do not overcome the extract's inhibition. Chromatography of extracts has revealed inhibitory fractions. A phytochrome system is evident in the seeds of *S. carolinense*. Red light promotes germination, while far-red light inhibits. The effect of either wave length is reversible by the other. Far-red inhibition is overcome by exogenous applications of gibberellic acid. Certain nutrient salts promote germination. Additional drying increases germinability as has been observed with tomato seeds, a member of the same family.

(120)

A Preliminary Report of Animals Found on Granite Outcrops

FRED K. PARRISH, ROBERT M. HUIE, JR.,
AND JOHN J. BARNETT
Georgia State College

Although there is a sizeable literature concerning plant ecology and communities of granite outcrops, there are few reports concerning animals which occur in such situations. The primary area under study is a seven acre outcrop in north Rockdale County, Georgia, although collecting trips have been made to other outcrops nearby. The animals found during this study (1966-1969) were divisible into two groups—those characteristic of rock outcroppings (exclusively invertebrates such as the grasshopper *Trimerotropis saxatilis* (McNeill)) and those that were transient or ubiquitous (typified by the Eastern

Cottontail, *Sylvilagus floridanus*.) Mammals building nests under rocks or in broom sedge "islands" include the mice *Peromyscus* and the Eastern chipmunk, *Tamias striatus*. Other transient mammals include squirrels, *Sciurus carolinensis* and deer, *Odocoileus virginianus*. The fence swift, *Sceloporus undulatus*, occurs in large numbers; the only other reptile observed was the black racer, *Coluber constrictor*. A variety of invertebrates were found, the number and species varying with the time of year and the specific ecosystem. Sporadic blooms of collembolans have occurred which were sufficient to change the appearance of an acre of outcrop.

(20)

Location and Association of Shrubs in a Forest Community: A Statistical Analysis

E. GIBBES PATTON, *Wofford College*

In a study of the ecology of native shrubs, an electronic computer has indicated some association between species-pairs and between species and physical-environmental factors. By the method of Greig-Smith (second edition, 1964), presence-or-absence data from systematic point-quarter sampling were put into 2 × 2 contingency tables and the hypothesis of independent distribution was tested by use of chi-square. This method indicated some associations not apparent from non-quantitative analysis. Results are offered from study of ten shrub species in the North Saluda River drainage, Greenville County, South Carolina. Discussion is invited in terms of (1) validity of the sampling and (2) usefulness of the technique for studies in autecology, chorology, and community structure.

(Assistance from the Belle W. Baruch Foundation is acknowledged.)

(51)

Fine Structure of Centriole Formation in *Labyrinthula* sp. (Rhizopodea, Labyrinthulida)

FRANK O. PERKINS
Virginia Institute of Marine Science

The fine structure of de novo centriole formation was observed in meiotic zoosporulation in *Labyrinthula* sp. Vegetative spindle cells, which contained no centrioles, procentrioles, or centriolar plaques, formed presporangia by changing into approximately round or oval cells within sori. Two granular aggregates or protocentrioles approximately spherical and about 240 mμ diameter were formed in the cytoplasm a few hundred mμ from each nucleus. Microtubules, oriented in astral ray patterns, were attached directly to each of the protocentrioles. Following migration to opposite sides of the nucleus each of the protocentrioles differentiated into double centrioles attached at the cartwheel or proximal ends. Binary fission of the centrioles and reorientation yielded a diplosome or orthogonal orientation of the organelles. Each mature centriole consisted of the usual cylinder of 9 triplet microtubular blades with a cartwheel complex at the proximal end consisting of 5 or 6 tiers of cartwheels. Further centriole replication appeared to occur by orthogonal budding from mature centrioles.

(88)

Food Habits of *Plethodon jordani* (Amphibia: Plethodontidae)

VERNON N. POWDERS AND WILLIAM L. TIETJEN
Georgia Southwestern College

Plethodon jordani stomachs from the Great Smoky Mountains National Park were analysed for food content. These stomachs were from various different altitudes throughout *P. jordani*'s range in the park. Food items include: Collembola, mites, millipedes, snails, and various other Arthropoda. Very few empty stomachs were found during the study. An altitudinal and seasonal comparison of food items will be presented. Stomach analysis of *Plethodon glutinosus* will also be presented as a comparison of food habits between these closely related salamander species.

(144)

The Isolation of Protoplasts from the Placental Cells of *Solanum nigrum* L.

BALDEV RAJ AND J. M. HERR, JR.
University of South Carolina

Living protoplasts were isolated from the interplacental regions of *Solanum nigrum* berries by the removal of the walls from cells in tissue slices treated for 1-2 hours with 12% pectinase in 0.35 M sucrose solution. Protoplasts thus isolated, then washed and transferred to microculture chambers for observation, invariably tended to be spherical. Comparative measurements of cell and protoplast volumes revealed that 10% of the isolated structures were subunits of protoplasts. From volume changes in protoplasts studied in different osmotica, the maximum expansion of the cell membrane was determined. Hypertonic solutions promote stability, and protoplasts were maintained in 0.35 M sucrose solution for several days. The effects of various inorganic and organic compounds were also investigated to determine the optimal conditions for *in vitro* culture of isolated protoplasts.

(47)

Ultrastructure of *Spirodela Polyrhiza* (L.) Schleiden. I. Raphides and the Idioblast

R. D. RAO, *North Carolina State University*

Spirodela polyrhiza is a cosmopolitan aquatic belonging to the family Lemnaceae, commonly called the duckweeds. In the course of ultrastructural characterization of *S. polyrhiza*, the fine structure of the raphides and the idioblast was also investigated. Raphides are needle-like optically visible crystals, presumably of calcium oxalate, which occur in a wide variety of plants. The crystal chambers are elongate in form and when cut transversely they exhibit rectangular profiles. The crystal chambers appear to be compartmentalized by a single membrane. The individual chambers show an electron dense boundary.

The raphide cell is represented by a typical nucleus, sparse ER, Golgi and mitochondria. Concentric membrane profiles were also observed. The raphide cell lacks the so-called modified plastids. The non-accumulation of starch by the plastids appear to be species specific rather than a general phenomenon, for starch was seen to be present in the plastids of *S. polyrhiza* raphide cell.

(48)

Ultrastructure of *Spirodela Polyrhiza* (L.) Schleiden. II. Chloroplast Development During Turion Germination

R. D. RAO, *North Carolina State University*

The turion is a modified frond and a means of vegetative reproduction in *S. polyrhiza*. The plastids of turion are amyloplasts — starch storing plastids. The development of chloroplasts to maturity from amyloplasts accompanied by turion germination is completed by 48 hours. The main feature of the differentiation of amyloplasts is the development of an elaborate grana-fretwork system, which is preceded by reconstitution of the envelope. Once this is completed the subsequent development to maturity appears to follow the normal developmental pattern, that is, invagination of inner membrane to produce a grana-fretwork system.

(157)

The Effect of Zinc-65 on the Production of Lethal Genes in *Drosophila melanogaster*

JAMES H. RAY AND JOHN M. CARPENTER
University of Kentucky

Drosophila melanogaster adults were placed in population cages with food containing Zinc-65 in a concentration of 97.2 $\mu\text{C}/\text{ml}$. Per cent hatchability of daily egg samples was used as an index for dominant lethal genes produced by the radioactive environment. To test for recessive sex-linked lethal gene production, adult males were removed from the cages at intervals during the experimental period and mated to non-radioactive Muller-5 virgin females using the Muller-5 technique. Daily percentages of dominant lethal genes ranged from 0 to 43%, and the peaks of egg mortality appeared to follow a cyclic pattern. Small percentages of recessive sex-linked lethal genes were found in the P_1 , F_1 , and F_2 control and experimental samples. Although greater percentages of recessive sex-linked lethal genes were produced with increasing radiation exposure, experimental results did not appear to differ significantly from control results. Experiments are currently underway using higher concentrations of Zinc-65.

(45)

An EM Study of the Dendritic Keratinocytes of the PET Mouse

WILLIE M. REAMS, JR. AND STANLEY P. TOMPKINS
*University of Richmond and The Medical
College of Virginia*

An EM examination of the epidermis of PET mice reveals a mixed population of cells. Most prevalent are the polyhedral keratinocytes with oval nuclei, many desmosomes and tonofilaments. In addition, three types of dendritic cells have been described previously, all of which have lobated nuclei, and lack desmosomes and tonofilaments. Some of these dendritic cells are pigment cells with melanosomes or premelanosomes; others are Langerhans cells with their typical organelles; while the third type lacks characteristic organelles and are known to be a mixture of both melanoblasts of neural crest origin and pre-Langerhans cells. In a developmental study of the Langerhans cell, cells have been found in both embryo and older epidermis which differ from both the above dendritic cells and the surrounding keratinocytes. These cells have lobated nuclei and show few desmo-

somes and tonofilaments. As such semikeratinocytes, like Langerhans cells, are found in neural crest-free as well as normal epidermis, it is tempting to speculate that they might be precursors of the Langerhans cells.

(Supported by NIH Grant AM-11864-02. The work was done in part at the Virginia Institute for Scientific Research.)

(106)

Uptake and Elimination of Radiotungsten In Black Bullheads (*Ictalurus melas*)

JAMES R. REED, *Virginia Commonwealth University*

Black bullheads (*Ictalurus melas*) were found to accumulate radiotungsten from food and from water. Whole-body activity reached a plateau after the fish had been in isotope solution four days. Whole-body elimination of radiotungsten varied somewhat with the method of uptake. Fish that had accumulated radiotungsten from water had a single linear component of elimination with a biological half-life of 2.75 days. Fish that received radioisotope in a single feeding lost activity at two rates, one component had a biological half-life of 14 hours and the second of six days. The bone, skin, flesh, blood and gills contained the greatest percentages of whole-body activity after one day of uptake from water. After eight days of uptake the flesh, gills and gut together contained 43.4 percent of the total activity. The bone had the longest biological half-life (8.0 days) of the tissues examined and contained 80 percent of the whole-body activity after 16 days of elimination.

(191)

Esterases of *Procyotrema marsupiformis* Harkema and Miller, 1959 (Trematoda: Strigeida: Diplostomatidae)

WILLIS A. REID, JR. AND REINARD HARKEMA
North Carolina State University

This strigeoid trematode, parasitic in the pancreatic duct of the raccoon, was studied for the histochemical localization of esterase activity. The worms were prefixed in 10% buffered formalin, cryostat-sectioned and treated with the following substrates: α -naphthyl acetate, 5-bromoindoxyl acetate, acetylthiocholine iodide, and butyrylthiocholine iodide. Inhibitors used were sodium fluoride, eserine, iso-OMPA, and 62-C-47. In all tests the pharynx demonstrated the most intense reaction, apparently due to a mixture of simple esterases and acetylcholinesterase. A strong reaction indicating acetylcholinesterase activity was obtained in the oral sucker, acetabulum, pseudosuckers and its glandular cells, the cuticle and subcuticular cells in the oral sucker region, nerve tissue, and the bursa. Non-specific esterases were indicated by a weaker reaction in the subcuticular cells of the holdfast, the outer tunic of the testis, the vas deferens, and the prostatic cells. Pseudocholinesterase was not demonstrable in the worm.

(28)

Microsporogenesis In *Vernonia angustifolia* Michx. (Compositae)

JOHN D. REYNOLDS, *Virginia Commonwealth University*
AND
SAM B. JONES, JR., *University of Georgia*

The anther first consists of meristematic tissue. In each angle, hypodermal cells, aligned vertically, enlarge

and divide periclinally. The conductive tissue differentiates at this time. During enlargement of the microsporocyte the anther wall consists of epidermis, a hypodermal layer and uninucleate tapetal cells. The hypodermal layer divides to form the endothecium and the middle layer which is flattened and crushed by the time the meiotic process begins in the microsporocytes. These are arranged in a single vertical row in each of the four loculi. Two meiotic deviations result in four nuclei in a tetrahedral, isobilateral or decussate arrangement. Wall formation is simultaneous. The pollen mother cell wall still encloses the microspores at exine formation. Each microspore is surrounded by a homogeneous substance until the echinae form. Pollen grains are three celled when released. Tapetum is glandular and persists until dehiscence. Tapetal cells are uninucleate, binucleate, and later contain fusion nuclei.

(15)

Aspects of Phytoplankton Primary Production in a Shallow, South Florida Lake

PETER B. RHOADS

Environmental Biology Program, University of Miami

Short term light and dark bottle experiments were used to estimate phytoplankton primary production in a shallow, limestone rockpit lake, during 1968. These results are examined in terms of plankton data and physico-chemical variables, with particular attention to incident radiation, rainfall and grazing. With the exception of a spring *Dinobryon* bloom, a low phytoplankton standing crop was observed, dominated by nanoplankton. Primary production estimates indicate a low mean phytoplankton production level (about 200mg C/m³/day), despite the influence of the surrounding residential area. Indirect evidence is presented indicating that the benthic flora dominates organic production. Low phytoplankton levels are analyzed in terms of a benthic flora competition hypothesis.

(16)

Aerial Photoecology of South Florida Patch Reefs

PETER RHOADS, PATRICK COLIN,
JOHN BEERS AND HOWARD TEAS

Environmental Biology Program, University of Miami

South Florida patch reefs typically exhibit a "halo" of bare sand caused by grazing of herbivorous reef fishes. Aerial photographs revealed that in a few cases patch reefs off southern Dade County had a second bare sand halo or band. The second band is approximately ten meters wide and concentric with the reef at a distance of 50-75 meters. A mixture of the sea grasses *Syringodium filiforme* and *Thalassia testudinum* grow in the area on a calcareous sand and coarse particulate substrate. The grasses have been transplanted to various locations in the inner and outer halo band areas and examined for feeding by herbivorous fishes. Heavy grazing was found in the inner region but not in the outer halo. The results of transplant experiments and geological observations in the double halo reef area will be illustrated with slides.

(Supported by U.S. Public Health Service training grant No. ES-00126.)

(32)

White Flowering Partridge Pea in North Carolina

HOLLIS J. ROGERS AND RALPH M. MORRISON
University of North Carolina at Greensboro

The partridge pea (*Cassia fasciculata*) is a native annual plant about 15 cm to 45 cm high. It is generally found along road sides, sandy fields and open creek banks from Florida to Texas, and north to Massachusetts and New York. Its leaves are evenly pinnate with twelve to thirty linear-oblong leaflets. The bright yellow flowers make the plant conspicuous during the months of August and September. The flowers have five petals, two or three of which are larger than the others with a purple spot at their bases. In 1931, L. C. Jensen reported plants with a distinct creamy white color in Franklin County, Missouri. These plants have subsequently been placed in forma *Jenseni* (1935). Jensen collected seeds from the white flowered plants and of the forty plants produced, all but two showed the new flower color.

One of us (H. J. R.) found the *Jenseni* form along an open creek bank in the city of Greensboro. As far as we can determine, this is the first reported find of this form outside the original location in Missouri and definitely the first report for North Carolina. Seeds were collected from both the yellow and white flowered populations. Germination studies have shown that scarification effectively breaks seed dormancy. At present we are maintaining both populations in the greenhouse. Our report will include the results of these growth studies in terms of the genetics and cytology of the white form of *Cassia*.

(68)

Morphology of the Male Reproductive System in the Hawaiian Kona Crab, *Ranina Ranina* (L) (Decapoda: Gymnopleura)

EDWARD PARSONS RYAN, *East Carolina University*

A study of the morphology of the male reproductive system and details of ultrastructure in spermatogenesis was undertaken on the Hawaiian Kona crab, *Ranina ranina* (L), whose family includes members that are of the oldest brachyuran fossils and whose recent members display both lobsterlike and crablike characters. The morphology of the reproductive systems in both sexes is more macruran (lobsterlike). Cytological studies of spermatogenesis reveal aflagellate spermatozoa that are unlike other Brachyura in ultrastructure and in probable function. The spermatozoa are transferred to the female sternal spermatheca without spermatophoric elements.

(This research was supported by National Science Foundation Grant GB 5710.)

(145)

In Vitro Culture of Ovules, Nucelli, and Embryos of Citrus

P. S. SABHARWAL

Investigations were carried out on the in vitro growth and development of ovules, nucelli and embryos of six polyembryonate species of *Citrus*: *C. aurantifolia*, *C. limettioides*, *C. microcarpa*, *C. paradisi*, *C. reticulata* and *C. sinensis*, and one monoembryonate species, *C. grandis*. A modified White's medium served as control. Adenine, casein hydrolysate, coconut milk, 2, 4-D, IAA, kinetin and yeast extract were added as supplements.

Ovules of the polyembryonic species of *Citrus* were cultured at the globular stage of nucellar proembryos. The embryos either developed normally or callused or formed buds on a medium containing CH (400 ppm). Embryo-like structures differentiated from the callus and some of them even gave rise to seedlings.

Micropylar halves and segments of nucelli (from which the zygotic embryo or the extreme tip portion was removed) of several polyembryonate species were cultured. Only the proembryos responded while the cells of the nucellus *per se* remained quiescent. On CH medium, the behaviour of embryos was similar to that observed in the cultured ovules. When subcultured, the callus differentiated into embryo-like structures which later developed seedlings. Cultures of nucelli of *C. grandis* failed to thrive on Wb and CH media. However, on a CM medium, nearly 25 per cent of the embryos matured and germinated in situ.

Micropylar halves, from which macroscopic nucellar proembryos had been excised, and the chalazal halves of nucelli showed no response.

When globular nucellar embryos were cultured individually on CH medium they merely enlarged or gave rise to a callus of limited growth. Groups of adventive embryos of *C. reticulata* elicited a response almost similar to that of the embryos in the micropylar halves of nucelli, but embryonal callusing was less pronounced.

(160)

A Model System for Population Genetics Experiments

W. ST. AMAND, *University of Mississippi*

A model system (using ordinary snaps) is described which allows population genetics experiments to be performed during a single laboratory session. The design involves large population simulation and allows the collection of data to illustrate the Hardy-Weinberg equilibrium, and the effects of partial or of complete selection. With slight modifications such phenomena as forward and reverse mutation, hybrid vigor, reduced reproductive potential, etc., can also be studied. The materials employed are simple, inexpensive, and everywhere available.

(58)

The Role of Sterols in Photodynamic Response

KEITH T. SAMUELS, JR. AND R. W. HULL
Florida State University

When the ciliate *Paramecium caudatum* is exposed to an aqueous suspension of 3,4-benzpyrene and irradiated with long-wave ultraviolet light, the cells become immobile and eventually lyse in a length of time that is a function of concentration of the hydrocarbon and the intensity of irradiation. This process is termed photoactivation and appears to involve photo-oxidation and free radical formation. *Tetrahymena pyriformis*, strain w, is less sensitive in this system. It is postulated that the lack of sensitivity may be due to a sterol, tetrahymenol, (identified by Conner, 1963), found as a component of the cell membrane of *T. pyriformis*, which sterol is not found in *Paramecium*. This sterol is methylated ergosterol. To test this postulate, *T. pyriformis* was grown under conditions devised to replace the tetrahymenol with ergosterol. The treated cells were then subjected to the photoactivation circumstance, using cells with tetrahymenol unreplaced as controls. The membranes of normal and treated cells were analysed by thin-layer and gas-liquid chromatography.

(72)

Life Histories of Wolf Spiders (Lycosidae: Araneae: Arachnida) in the Alpine Tundra of Colorado

RONALD R. SCHMOLLER, *The University of Tennessee*

About 2,000 specimens of *Pardosa* wolf spiders were collected in the alpine tundra of Colorado during 1966 and 1967. Pitfall jars were placed in a variety of habitats, ranging from tree-line (11,400 ft.) to rocky summits (14,000 ft.). The jars were sampled twice a month during June - October, 1967. The five most numerous species of *Pardosa* collected occur in different plant communities. The life-cycle length, overwintering stage(s), mating periods, and time of hatching were determined for these spiders. Three of the species have annual (one year) life cycles and overwinter in the penultimate stage (the instar preceding adulthood). The other two species have biennial (two year) life cycles, overwintering in various stages. Biennial life cycles may be correlated with lower prey densities in the habitats of the biennial species, as suggested by the low net (plant) productivity of their habitats. Temperature, moisture, and wind may also be important.

(149)

Regulation of Urease in Cotyledons

PREM P. SEHGAL AND JAMES A. COOK
East Carolina University

The factors controlling urease levels in cotyledons of jack beans were studied under sterile conditions. In culture, the urease content declined as rapidly as in cotyledons harvested from seedlings of different ages. High temperatures (85°) or low pH (4.5) caused a faster decrease in urease activity as compared to the controls (75°F, pH 5.8). The addition of dithiothreitol — a sulfhydryl compound, urea or thiourea lead to increased urease activity on fresh weight and protein basis. In experiments with urea, a continuous flow of sterile medium was maintained to avoid excessive accumulation of ammonium ions in cotyledons. Higher urease activity in urea is attributed to substrate protection. Thiourea, a competitive inhibitor of the enzyme gave best preservation of urease in contrast to urea-treated and untreated cotyledons. Thiourea and other substituted ureas are used as herbicides. Possible mechanism of action of thiourea will be discussed.

(189)

Light and Electron Microscope Radioautographic Studies of Galactose-H³ Utilization Related to Mucopolysaccharide Synthesis in *Megalodiscus temperatus*

W. ALLEN SHANNON AND B. J. BOGITSH
Vanderbilt University

Mucopolysaccharide synthesis is investigated by incubating slices of *Megalodiscus temperatus* in a medium containing galactose-H³. The tissue is subsequently fixed and radioautographed for light and electron microscopy. Labelling appears to be mostly cytoplasmic. The initial uptake of the label is confined to the subtegumental cells with a progression toward the external surface with time. Electron microscopy shows labelling specifically over the Golgi areas and related vesicles, vesicles in the tegument, and to a lesser extent over glycogen. (Supported, in part, by N.I.H. grant No. AI-0858.)

(1)

Accumulation of Metals by Fungi II. Zinc, Iron and Yttrium Group

J. MILES SHARPLEY AND D. G. KESSEL
*Virginia Commonwealth University AND
Sharpley Laboratories, Inc.*

The limits of iron and zinc accumulation by the mycelia of a *Hormodendrum* sp., *Pullularia pullulans*, and *Aspergillus niger* have been defined. *Pullularia* was found to tolerate up to 3 percent zinc (30,000 ppm) in the culture medium and able to concentrate 20,000 ppm of zinc in the mycelial mass. *Hormodendrum* and *A. niger* were less tolerant of the metals but appreciable amounts were accumulated. The relationship of the tolerance for zinc by *Pullularia* is discussed as correlated to the growth of this organism on zinc containing paint films.

The preliminary data concerning the concentration by fungi of certain rare earth metals from sea water and salt brines are presented. These data indicate up to a 10-fold concentration of members of the yttrium group, based on emission spectroscopy of the ashed fungal mycelia.

(140)

The Crisis of Herbaria

STANWYN G. SHETLER, *Smithsonian Institution*

Notwithstanding optimistic predictions, the future of the herbarium as a research institution and facility seems to be endangered. Quantitative gains have been mistaken for progress and good health, while in fact the physical facilities, operational procedures, collection strategy, and intellectual undergirding of the herbarium have not kept pace with the times. The future has been measured against the past and the present, yielding predictions of no lasting value. In this paper, an attempt is made to present a constructive analysis of what is needed to insure the continuing vitality of the herbarium. A brief survey of the world's herbarium resources is given, and the problems of managing and utilizing these resources are discussed. The changing role of the herbarium is traced, and several proposals for copying realistically with the changes are offered.

(119)

A Comparative Study of Thermal Stratification in a Mainstream and Pumped-Storage Impoundment

GEORGE M. SIMMONS, JR.
Virginia Commonwealth University
STUART E. NEFF, *Virginia Polytechnic Institute*

Claytor Lake Reservoir is a mainstream impoundment on the New River near Radford, Virginia, and power is generated by conventional draw down. Smith Mountain Reservoir is the upper storage impoundment of a pumped-storage hydroelectric plant on the Roanoke River near Roanoke, Virginia. In pumped-storage operation, water is recycled from a lower to an upper storage impoundment during periods of low power use and is drawn down during generation at peak demand periods. Thermal stratification in the two reservoirs is quite different. The metalimnion at the height of summer thermal stratification is 5-7 meters deep in Smith Mountain Reservoir and 23-26 meters deep in Claytor Lake Reservoir. Location of the metalimnion and the hypolimnetic volume seems to depend upon penstock location and the retention period of water in each reservoir. The re-

cycling process in Smith Mountain Reservoir has a minimal effect on thermal stratification. The beneficial effects of recycling are localized due to basin morphology.

(77)

Suctorina in Culture

TOM SIMPSON AND R. W. HULL, *Florida State University*

The paucity of published reports on the biology of Suctorian protozoa can be attributed to difficulties in achieving laboratory cultures of these interesting forms. Suctorians typically "bloom" in nature, as well as in laboratory culture, but the causes of these blooms are as yet not well established. Between blooms, it is common for laboratory cultures to fail due to a generalized autolysis of the cells coupled with a greatly reduced reproductive rate. Several workers (Rudzinska, 1951-1953; Lilly, 1953; Sterbenz, *et. al.*, 1955) have dealt with this and related problems in Suctorian biology, but none have yet developed techniques that yield assured culture of Suctorians collected from the field. This investigation discusses methods used for culturing three species, *Solenophrya micraster*, *Tokophrya quadripartita*, and *Helio-phrya sp.* The culture parameters for these as well as their reproductive cycle will be discussed. Optimal rates of feeding, important in keeping cultures from decline, will be presented and characteristics of their reproductive rates will be summarized. In addition, investigations into the delay of morphogenesis by chelating agents will be presented as a method of altering cultures for experimental studies on the ciliated bud. The nonmetamorphosing cells may be viable for up to 96 hours with little or no change in morphology. The achievement of axenic cultures of Suctorina and the unique characteristics of these cultures will also be discussed.

(66)

An Assay for FSH in the Golden Hamster

MICHAEL H. SIMS, DEASON C. DUNAGAN,
AND GEORGE W. TATE, JR., *Memphis State University*

A modification by Benson (Endocrinology 84: in press) of the Steelman and Pohley assay for FSH has been adapted for use in the golden hamster. Benson's modifications provide for more sensitive measurements of serum FSH than previously used bioassay methods. Employing immature female hamsters (22 days old) as assay animals, series of dilutions of FSH preparations of known potencies were run to standardize the ovarian response. Ovarian weight in the immature animals was the parameter measured. The ovarian response to serum from adult animals during the estrous cycle and pseudo-pregnancy will be compared with the ovarian response to standardized FSH amounts. Details of the assay procedure as well as preliminary data on comparisons between standardized injections and serum FSH will be presented.

(This work was supported by a grant from the Memphis State University Faculty Research Fund.)

(36)

Toxins of Single Spore Isolates of *Pellicularia filamentosa*

ASA C. SIMS, JR., *Southern University in New Orleans*

Pellicularia filamentosa is an important plant pathogen. In order to find the nature of parasitism of this

pathogen toxic metabolic products from culture fluids of single spore isolates were separated and characterized. It was found that at least 4 different toxic metabolites were isolated according to their solubility in water, ether, ethyl alcohol and acetone. Each toxin in contact, with germinating seeds of flax and alfalfa did not cause typical symptoms of the damping off disease, where as when the toxins were combined together in known strengths, fairly representative typical symptoms were obtained.

(174)

Hormonal Changes in Rats Cross-Adapted to Cold Environments and Simulated High Altitude

J. ALVIN SMEAKE AND SAMUEL R. TIPTON
The University of Tennessee

Rats acclimated to 7°C. were exposed to 10,000 feet simulated altitude until acclimated. The acclimation to cold interfered with the acclimation to altitude. The possibility that this negative cross-adaptation was being mediated by some metabolic response induced by thyroxine was investigated. By treating hypothyroid rats with thyroxine, a response similar to that of cold-acclimated rats could be induced. Hypothyroid rats treated with 2,4-dinitrophenol showed an increase in tolerance to extreme altitude, but thyroxine reduced this tolerance. If protein synthesis were blocked with actinomycin-D before or at the same time of thyroxine treatment, but not after, the inhibitory effect of thyroxine could be abated. Treatment with epinephrine or pargyline produced the same response on tolerance as that of thyroxine.

(Aided in part by funds from Public Health Service Research Grant AMO7365 and NASA Grant NGL-43-001-021.)

(117)

Absolute Densities of Small Mammals

MICHAEL H. SMITH, *University of Georgia*

The number of mammals (N) at risk of capture is easily estimated from the data derived from removal trapping. However, N is of little value in certain studies where density is of prime interest. Two different techniques may be useful in estimating the area being sampled: (1) The spatial distribution of captures for animals moving onto a grid is different from that of resident animals. The number of shifting animals caught in successive rows of traps from the outer edge to the middle of the grid is a curvilinear function. Subtraction of shifting animals from total catch equals the number of animals residing on the area occupied by the grid plus a border zone equal to the radius of the average home range. (2) Assessment lines going outward from the grid for a relatively long distance can be used to measure the area affected by the grid. The use of these techniques will be illustrated with data from a mixed hardwood small mammal community.

(22)

Effect of a Heated-Water Discharge on the Distribution of Benthos in a Portion of Biscayne Bay, Florida

RICHARD C. SMITH, *Environmental Biology Program, University of Miami*

The annual and long-term changes in distribution of benthic invertebrates, grasses, and macro-algae, due to

a heated-water discharge from a small electricity generating station (430 megawatts), have been evaluated. Quantitative benthic samples at ten stations, beginning in the fall of 1968, have been examined to evaluate monthly changes in abundance and diversity of the benthos. In addition to benthic sampling, data were collected on salinity, particles size and organic content of sediment, and temperature of sediment and water. Aerial photographs, taken prior to construction of the generating station, indicated a "benthic pattern" in the area of study which is presently found at other locations in Biscayne Bay. These patterns are being investigated to evaluate the long-term changes in the area of the generating station discharge.

(Supported by U.S. Public Health Service training grant No. ES-00126.)

(114)

Some Effects of Zinc on the EKG and Breathing Signal of Bluegills (*Lepomis macrochirus* Rafinesque)

RICHARD E. SPARKS, ALAN G. HEATH,
AND JOHN CAIRNS, JR.
Virginia Polytechnic Institute

Polygraph recordings were made of the heart and breathing activities of twelve 5 - 7 inch bluegills (*Lepomis macrochirus* Rafinesque). Experimental fish were exposed to zinc concentrations of 56 mg/l and 10 mg/l in continuous flow test chambers. Two of four fish exposed to 56 mg/l zinc showed a marked decrease in amplitude of the breathing signal immediately upon addition of zinc. In 10 to 31 minutes, the amplitude of the breathing signal began to increase slightly. The heart rate of all experimental fish gradually decreased over a period of 2 to 6 hours, while the breathing rate increased. One to four hours after addition of zinc, the breathing rate of experimental fish was faster than the heart rate. In contrast, the heart rate of control fish was always faster than the breathing rate and both rates remained relatively constant. Thus indicators of functional damage to bluegills appear before the actual death of the fish due to zinc toxicity.

(This research was supported by a grant from the Manufacturing Chemists Association.)

(132)

An Ecological Study of a South Carolina Salt Marsh

RICHARD STALTER AND WADE T. BATSON
University of South Carolina and High Point College

The vegetation of a South Carolina salt marsh was sampled by means of line transects and 1m² quadrats. Soil samples were taken from specific points on the transects and analyzed for conductivity, chlorinity, salinity, pH, texture, and organic content. A surveyor's transit and stadia pole were employed to determine zonation limits of vegetation, and a recording tide gauge was used in conjunction with the aforementioned to determine the duration and depth of flooding of each vegetation zone. The limits of the vegetation zones, arbitrarily determined, will be discussed in conjunction with the above factors. The pH is unimportant in restricting the vegetation to certain zones. Soil texture is of doubtful importance. Organic content may be important in restricting certain species, although the direct effect of organic content was

not determined. The soil solute concentration and depth and duration of flooding may be important as these factors correspond well with the range and development of the vegetation. Likewise, the soil solute concentration corresponds well with species distribution. Flooding may be important in restricting the seaward range of all plants except *Spartina alterniflora*. The evidence presented in this study suggests that flooding and the action of the tides in general may produce conditions that are unfavorable for the establishment and subsequent early development of all species except *S. alterniflora*. These factors and conditions were considered important in defining the zones of vegetation on this salt marsh.

(159)

The Analysis of Tritiated Thymidine Incorporation in Grasshopper Neuroblasts

RALPH E. STEPHENS AND J. GORDON CARLSON
The University of Tennessee

Embryos of the grasshopper, *Chortophaga viridifasciata* (De Geer), equivalent to 14 days development at 26°C were incubated at 38°C in H³-thymidine (10μc/ml; 1.48 × 10⁻³M) for ½, 1, 2, 4, 6, or 8 hours. At the end of each exposure 3 embryos were made into squash preparations and autoradiographed. The number of grains was determined in an area of 113 square microns chosen at random over each of 50 neuroblasts per embryo. Selected cells were in the stage of DNA replication. The average counts rise steadily through 4 hours, level off from 4 through 6 hours, and fall gradually from 6 to 8 hours. A frequency distribution analysis of counts in individual cells is interpreted to mean that the leveling-off and fall in counts from 4 to 8 hours may be due to some combination of the following factors: (1) a possible saturation effect, (2) anaphase division, in which the incorporated thymidine per cell is halved, (3) a possible slowing-down of the mitotic rate after several hours in culture medium, and (4) a possible inhibitory effect of thymidine on mitosis.

(This study was supported in part by Atomic Energy Commission Contract AT-(40-1)-2575.)

(176)

The Effects of Salinity on Blood Free Amino Acids in the Land Crab, *Cardisoma guanhumi* (Crustacea: Decapoda: Gecarcinidae).

JAMES D. STIDHAM AND CHARLES E. LANE
Presbyterian College and Institute of Marine Sciences,
University of Miami

The land crab, *Cardisoma guanhumi*, a semi-terrestrial crab of South Florida, the Caribbean Islands and South America is found in a wide range of environmental salinity. We here report the findings of one area of our studies of osmoregulation in this crab. Adults of uniform size were maintained in distilled water, tap water, and sea water of varying salinities. Qualitative and quantitative changes in blood free amino acids were determined using automatic ion-exchange chromatography. Twenty free amino acids were identified with glycine, taurine, arginine, proline and alanine predominating in crabs from all experimental environments. These five amino acids were seen to increase with increasing salinity with alanine exhibiting the greatest increase over the entire range from distilled water through 175‰ sea water. The significance of extracellular and intracellular free amino acid pools in this organism will be included.

(61)

The Effects of Nitrate and Chloride Ions on Motility, Glucose and Oxygen Utilization in Rabbit Spermatozoa

BETTYE R. STOKES, *Atlanta University* AND
CLYDE E. JOHNSON, JR., *Clark College*

This work describes the effects of Norman-Johnson II (Cl) and III (NO₃) diluents on the metabolism of New Zealand White rabbit spermatozoa. The oxygen uptake of cells in the N-J-III diluent containing nitrate anions was 57% greater than that of sperm in the N-J-II diluent, which contained chloride anions. Sperm in N-J-III exhibited a 37% greater utilization of glucose than sperm in N-J-II. Motility of cells was also greater in the nitrate medium. In addition to the effects of nitrate and chloride anions on oxygen uptake and glucose utilization, the effects of these ions on the lactate production exhibited by these cells will be discussed.

(19)

New Primary Productivity of a Regularly-flooded North Carolina Salt Marsh

LINDA M. STROUD AND ARTHUR W. COOPER
North Carolina State University

Estimates of net primary productivity of major vegetation types in the regularly-flooded marsh at Oak Island in Brunswick County, North Carolina were made. A harvest method was used to obtain standing crop estimates of vegetative types. The average behavior of the crop through a growing season was obtained by fitting the observed data to a fourth degree polynomial in time. The R² values obtained using this equation were generally good for all vegetation types. Net production was then determined by two methods: 1) using only living standing crop estimates and 2) using changes in living and dead standing crop estimates. Productivity estimates obtained in this study were not as high as values obtained in previous salt marsh studies at Sapelo Island, Georgia but were similar to other data for North Carolina and greater than data from farther north along the Atlantic coast. Reasons for these differences will be discussed.

(121)

Fallout Studies on Native Vegetation. I. Effects of Beta-Radiation (⁹⁰Sr) on White Pine and Red Oak Trees

FRED G. TAYLOR, JR. AND JOHN P. WITHERSPOON
Radiation Ecology Section, Health Physics Division
Oak Ridge National Laboratory, Oak Ridge

The major radiological hazards from fallout deposited on natural or agricultural ecosystems are external gamma and beta radiation and internal beta radiation from assimilation of radionuclides. With reference to plants, the hazard of surface contact with beta emitting fallout particles and the hazard of beta-field radiation where plant habitats are covered with fallout particles, has not been fully determined.

During the past year beta radiation sources and techniques of botanical application have been developed. Current radiobotanical studies are directed toward determining beta radiosensitivities of important native plant species.

Utilizing a strontium-90 fallout simulant, contact and beta bath exposure experiments have been conducted with white pine and red oak trees. Biological effects of contact doses (0.2 to 300 rads/hr) varied from 47% growth reduction to 100% lethality of apical meristems in pines. A beta bath dose of 600 rads proved lethal by 30 days. In red oak trees total bath doses exceeding 1500 rads in 1 to 3 days were sufficient to kill apical buds, while doses ranging from 500 to 750 rads reduced shoot growth by 50%.

(Research jointly sponsored by the Office of Civil Defense, Department of Defense, and the U.S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(38)

Serological Relationship of *Protosiphon* to Selected Chlorophycean and Xanthophycean Algae

DEMPSEY L. THOMAS
Louisiana State University in New Orleans

Serological data indicate that the green alga *Protosiphon* (14 isolates tested) is related to four other chlorophycean genera: *Spongiochloris* (6 species), *Spongiococcum* (3 species), *Neochloris* (3 species), and *Bracteococcus* (9 species). *Protosiphon* shows no serological affinity to the xanthophycean genera *Botrydium* (3 species) or *Botrydiopsis* (3 species). Antigens of the seven genera were reacted with antisera produced against *Protosiphon*, *Spongiochloris*, *Bracteococcus*, *Botrydium*, and *Botrydiopsis*. None of the chlorophycean algae reacted with *Botrydium* or *Botrydiopsis* antisera. Conversely, no *Botrydium* or *Botrydiopsis* species reacted with any antisera against the green algae. This strongly suggests a very weak relationship, if any, between chlorophycean and xanthophycean algae. All chlorophycean genera exhibited intergeneric affinity and the two xanthophycean genera also showed a similar relationship. These serological data support current taxonomic classification.

(113)

Changes in Movement Patterns of Fish Exposed to Sublethal Concentrations of Zinc

WILLIAM T. WALLER AND JOHN CAIRNS, JR.
Virginia Polytechnic Institute

Recent literature contains numerous references which indicate that waste disposal concentrations which merely permit survival of aquatic organisms may not permit them to function properly. This research was undertaken to develop a rapid feed-back monitoring system using fish movement patterns as an indicator of normal function.

Movement patterns of *Carassius auratus*, Linnaeus, exposed to lethal and sublethal concentrations of ZnSO₄ · 7H₂O were monitored using a series of light beams and photo-resistors. Six, five-gallon aquaria each equipped with three light beams transversing the aquaria at the bottom, middle, and top constituted the monitoring apparatus. Electronic counters were advanced each time a fish passed through a light beam. Results of ZnSO₄ · 7H₂O exposure obtained using static test conditions, a twelve-hour photoperiod, synthetic dilution water, and a single fish per tank showed a high degree of variability in the movement patterns; however, increases or decreases in activity and changes such as photoperiod reversal were apparent.

(Supported by Manufacturing Chemists Association.)

(56)

Ultrastructural and Time-lapse Studies of *Trachelomonas*, *Lepocinclis*, and *Euglena* (Euglenophyceae, Euglenales) with Special Reference to Eyespots

PATRICIA L. WALNE AND CAROLE A. LEMBI
University of Tennessee

Phase-contrast and electron microscopy and microcinematography were used to study cellular details in 3 genera of euglenoid flagellates. These organisms afford interesting comparisons — *Trachelomonas*, which displays "metaboly" (euglenoid movement) within a protective lorica; *Lepocinclis*, which is naked like *Euglena* but "non-metabolic"; and *Euglena*, which is naked and undergoes metaboly. Special emphasis will be given to the comparative ultrastructure of the extrachloroplastic eyespots in these genera and to the positional relationships of the eyespots with other organelles.

(Research supported in part by a University of Tennessee Biomedical Sciences Support Grant, 1101R-01, and a Faculty Research Grant to the senior author.)

(23)

The Vascular Plants of Tipton County, Tennessee

SARAH WARRINGTON AND E. T. BROWNE, JR.
Memphis State University

Tipton County is one of the five westernmost counties of Tennessee. Within its boundaries are parts of two floristic provinces: the Eastern Deciduous Forest Province and the Coastal Plain Province. The former extends eastward from the loess bluffs that rise abruptly from the Mississippi Alluvial Plain, and the latter is associated with the lowlands and bottomlands of the Mississippi and Hatchie Rivers.

The soils of the Eastern Deciduous Forest have developed from loess deposited in the Pleistocene Epoch, while the soil of the Coastal Plain Province is alluvium of Recent origin and is continually being deposited, transported, and redeposited. The several soil types support a wide variety of species.

(27)

The Arborescent Flora of Mississippi

J. RAY WATSON, *Mississippi State University*

The known arborescent flora of Mississippi consists of 200 native and naturalized species distributed in 76 genera and 43 families. In addition 16 cultivated species are known to occasionally escape. Genera with the largest number of arborescent species in the state are *Quercus* (32 species), *Crataegus* (22 species), *Carya* (13 species), *Ilex* (9 species), *Prunus* (9 species) and *Magnolia* (7 species). Certain species in the flora are known from one or a few locations. Among these are *Cladrastis lutea* (Michx. f.) K. Koch, *Gymnocladus dioica* (L.) K. Koch, *Magnolia tripetala* L., *Prunus hortulana* Bailey, *Prunus munsoniana* Wight & Hedr., *Quercus austrina* Small, *Quercus macrocarpa* Michx., and *Quercus mississippiensis* Ashe.

(129)

A Profile of Fernbank Forest

PAMELA J. WAY AND JOE A. EDMISTEN
University of Georgia

Fernbank Forest, located in Atlanta, Georgia, was sampled in various locations during the months of June to October, 1968. A profile was constructed from averages of the species present. This profile represents the structure of a typical southern mixed hardwood forest. Accompanying photographs were taken in October to show the trees in a winter condition. The profile method of representing a forest is superior to photographs because it gives a concise picture of what is to be found in the forest. This method could be a valuable educational tool in botany and related disciplines where a knowledge of taxonomy is not essential.

(31)

Quantitative Differences Between Gametophytes of Ferns with Sexual and Apogamous Reproduction

DEAN P. WHITTIER, *Vanderbilt University*

Gametophytes of ten apogamous and twenty-one sexual species of ferns in seven genera were studied in axenic culture. Besides the fact that only thirty-two spores are formed in the sporangia of apogamous species, their spores are larger than those of the diploid fern species. But spore size along with antheridium size is related to the level of ploidy and not to the type of reproduction. The gametophytic growth of the apogamous species in general was faster than that for the sexual species. Apogamous sporophytes were formed on smaller gametophytes in a shorter period of time than archegonia on the gametophytes of the sexual species. Thus the maturation of gametophytes producing apogamous sporophytes was more rapid than the gametophytes of the sexual species.

(59)

Radiosensitivity and Regulation of Population Density in the Yellow Fever Mosquito (*Aedes aegypti*)

WILLIAM K. WILLARD, *Clemson University*

Populations of the yellow fever mosquito, *Aedes aegypti* (L.), were exposed to a series of selected levels of X-rays (0 R, 1600 R, 3200 R, and 6400 R). Females mated with irradiated males produced a normal complement of eggs regardless of the dose administered to the males; however, the viability of the eggs decreased with increasing dose to the males. Nontreated females mated with irradiated males (6400 R) produced eggs which were only 0.0005% viable. Females treated with 3200 R and mated with nontreated males failed to produce eggs. Sterile individuals of either or both sexes were introduced into nontreated populations having a sex ratio of 1:1. The introduction of sterile males was more effective as a population control method when the percentagewise variation in egg viability was considered; however, the number of individuals produced was 11% less when sterile females were introduced than was found with the comparable introduction of sterile males. The more practical means of population control of *Aedes aegypti* was concluded to be the introduction of

sterile males. Contrary to observations in many species, the females were twice as sensitive to radiation as were the males when compared on the basis of the dose required to sterilize and with regard to the production of viable eggs.

(128)

Plankton, Detritus, and Clay Turbidities in the Mobile Bay-Gulf of Mexico Interchange

LOUIS G. WILLIAMS, *University of Alabama*

Based on the microscopic analysis of sediments from suspended materials in water samples turbidities varied directly with tidal turbulence and river runoff, with the highest plankton standing crops developing during periods of lowest inorganic turbidity. During peak plankton blooms the ultra plankton dominated, consisting of very tiny green and blue-green algae, while the gulf plankton was dominated by diatoms. Photosynthetic bacteria were an important component of the Mobile Bay estuary.

(122)

Fallout Studies on Native Vegetation. II. Field Retention of a Fallout Simulant by White Pine and Red Oak Trees

JOHN P. WITHERSPOON AND FRED G. TAYLOR
*Radiation Ecology Section, Health Physics Division
Oak Ridge National Laboratory, Oak Ridge*

Small white pine (*Pinus strobus*) and red oak (*Quercus rubra*) trees were contaminated in the field with a quartz fallout simulant containing ^{134}Cs . The initial fraction of the simulant retained by foliage was higher in the oaks (0.35) than in the pines (0.24). However, after 1 hour, the broad leaved oaks had lost 90.5% of the initial ^{134}Cs concentration while the pines had lost only about 10%. These early retention differences are related to the effects of wind on the two distinct foliage types. Effective half-lives were calculated for fallout on both species at intervals of 0 to 1 day, 1 to 7 days and 7 to 33 days. For pine trees these values were 0.25, 4.53 and 20.66 days, respectively. For oaks they were 0.12, 1.41 and 24.86 days. Loss of particles (^{134}Cs) was due, primarily, to the weathering action of wind and rain during the study.

(Research jointly sponsored by the Office of Civil Defense, Department of Defense, and the U.S. Atomic Energy Commission under contract with the Union Carbide Corporation.)

(43)

A New Species of *Cintractia* on *Fuirena* (Cyperaceae)

F. T. WOLF AND S. K. HASIJA, *Vanderbilt University*

The genus *Cintractia* (Ustilaginales) includes some 68 species of smut fungi parasitizing hosts belonging to the Cyperaceae and Juncaceae. A literature search failed to reveal any previous record of a smut parasitizing *Fuirena simplex* Vahl. The present description is based on material collected 17 August 1967, in Dawson County, Nebraska by Dr. Robert Kral. After comparison of characters of the sorus, spores, and epispore markings with those of *C. calderi*, *C. leucoderma*, *C. subinclusa* and *C. Taubertiana*, it has been decided to describe the smut on *Fuirena* as a new species.

(21)

Competition on Granite Outcrops between Two Species of *Talinum*

V. K. WRIGHT, *Emory University*

Talinum teretifolium ($2n = 48$) appears to be replacing *T. mengesii* ($2n = 24$) on granite outcrops in central Georgia where their distribution ranges overlap and where their niche requirement appears to be very similar. Field observations and laboratory experiments indicate that the seedlings of both species have a similar tolerance to desiccation. A significant difference in reproductive behavior does exist which would permit a unidirectional replacement where the species occur together.

(25)

The Ovule and Megagametophyte of *Smilax walteri* Pursh. (Angiospermae: Monocotyledoneae: Liliales: Liliaceae)

FRED T. YEATS AND J. M. HERR, JR.
University of South Carolina

The ovaries of *Smilax walteri* Pursh. usually contain three ovules, each one arranged in a position best described as curved 90 degrees from atropous. These ovules are bitegmic, and the inmost layer of the inner integument contains a resinous material. The composition of this material is discussed. The ovules are crassinucellate with several layers of parietal cells. The megaspore mother cell divides to form either a linear or T-shaped tetrad of megaspores, and the chalazal megaspore is functional. The defunct megaspores and the adjacent nucellus degenerate and form a persistent layer of cell fragments around the developing megagametophyte. Megagametogenesis follows a development essentially similar to the *Polygonum* type. Enlargement, concomitant with development, extends the megagametophyte and destroys the parietal tissue. The orientation of cells in the megagametophyte is variable and is discussed.

(75)

Life History of *Pleurobema cordatum* (Rafinesque, 1820)

PAUL YOKLEY, JR., *Florence State University*

The Ohio Pigtoe Mussel, a commercially valuable species, inhabits the largest rivers of the Ohio River drainage system, and occurs in concentrations or "mussel beds" in the Tennessee River. Oogenesis and spermatogenesis occur at cyclic intervals throughout the year with spawning and fertilization in April and May. Glochidia are formed in four to six weeks after fertilization in the marsupial outer gills. The parasitic glochidia, released mainly in June, attach to the gill filaments of the Rosefin Shiner, *Notropis ardens* (Cope), encyst, and transform into independent mussels in fourteen to eighteen days. A motile foot is developed during encystment but no increase in overall size results. Within three weeks after dropping from the host fish, the free-living naiads double in size. Sexual maturity is reached within four years and gonads remain functional throughout the remainder of the life of the individual which may be twenty-five to thirty years.

(146)

Pasteur Effect in the Corn Seedling

M. E. YOW AND B. H. WISE, *Memphis State University*

The intracellular control mechanism which produces the Pasteur effect is of functional value to the cell in decreasing the consumption of glucose under the aerobic conditions that cause the production of large amounts of ATP by the mitochondria. Several mechanisms have been proposed to account for this effect. Most investi-

gations to date have been performed using animal tissues. For our investigations the active meristematic distal portion of the primary root of the corn seedling was selected. There were several possible approaches to the problem. Our initial studies focused on the elucidation of control sites by detection of "crossover points" of relative depletion and accumulation of the glycolytic intermediates. These phosphate esters were measured by enzymatic methods before and after transfer of the seedlings from air to nitrogen.

Papers Received Too Late to be Included Alphabetically

(132a)

Vegetation and Landscape Processes on Amchitka Island, Alaska

C. A. AMUNDSEN AND E. E. C. CLEBSCH
The University of Tennessee

The grass-subshrub sub-arctic tundra of the Aleutian Islands is the result of a poor flora which has developed into a monotonous vegetation under fairly uniform and rigorous weather conditions. The few distinctive plant communities on Amchitka Island are most closely controlled by moisture gradients and are highly correlated with distinctive soil features.

(177a)

Dissociation, Inflammation and Reaggregation Phenomena In Livers of Chick Embryos Treated With Aminoguanidine Sulfate

CHARLES E. HUBERT, *Clark College*

Aminoguanidine sulfate injected at four days severely damages most hepatic cords of chick embryos. A few hepatic cords appear resistant to AGS and retain glycogen. Damaged livers are restored to normal quantitatively and histologically by 20 days.

The initial reaction involves inhibition of cord development, swelling of parenchymal cells and edema which separates endothelium from parenchyma. Dissociation and inflammatory phenomena then occur. The number of mononuclear cells indicates the degree of inflammation and the amount of destruction of the parenchymal tissue. Resistant cylinders accumulate excessive amounts of glycogen.

Spaces between resistant cylinders are progressively occupied by weakly PAS-positive ground substance containing small numbers of highly modified sub-lethally damaged surviving dissociated cells. Mononuclear cells remain present. Cells in this matrix gradually assume characteristics of parenchymal cells and collectively form hepatic cords. Formation of cyst-like parenchymal structures containing mitotic figures occur; these anastomose and collapse, forming typical hepatic cylinders.

University of South Florida Marine Science Institute Plans Ten Summer Courses

Ten marine science courses spanning the areas of biological, chemical, geological, and physical oceanography will be offered during the summer quarter of 1969 by the Marine Science Institute of the University of South Florida at the newly developed Bay Campus facilities near downtown St. Petersburg on Tampa Bay.

These courses are open to upperclass undergraduate and graduate students except for Plankton Systematics, designed for graduate students only. The deadline for application is May 27; registration for the two sessions will be held on June 8 and July 16.

June 9 to July 16: Phycology — Drs. Harold J. Humm and Clinton J. Dawes; Physical Ocean-

ography — Dr. Robert W. Flynn; Marine Geology — Dr. George M. Griffin; Marine Invertebrate Zoology I (Lower Invertebrates) — Drs. J. L. Simon and Frank E. Friedl; Physiology of Marine Animals — Dr. John M. Lawrence.

July 17 to August 22: Chemical Oceanography — Dr. Dean F. Martin; Ichthyology — Dr. Hugh H. DeWitt; Marine Invertebrate Zoology II — Drs. Frank E. Friedl and J. L. Simon; Physiology of Fishes — Dr. J. R. Linton; Plankton Systematics — Dr. Thomas L. Hopkins.

For detailed information write to Dr. Harold J. Humm, Director, Marine Science Institute, University of South Florida, St. Petersburg 33701.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — Position Vacant
Florida — John D. McCrone, University of Florida
Georgia — Fred K. Parrish, Georgia State College
Louisiana — Harry J. Bennett, Louisiana State University
Mississippi — Joseph Fitzpatrick, Mississippi State University

North Carolina — C. J. Umphlett, University of North Carolina
South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College
Tennessee — Donald Caplenor, George Peabody College
Virginia — Harry L. Holloway, Jr., Roanoke College

West Virginia — Earl L. Core, West Virginia University

Joseph F. Fitzpatrick, Jr. — Editor
Dept. of Zoology
Mississippi State Univ.
State College, Mississippi 39762

Notice. — Some limited response has been received from persons interested in a book review section for the *Bulletin*. Adequate coverage of the several disciplines, however, is not present among the volunteer reviewers. Again we ask that any other persons who are able and willing to provide book review services for ASB please contact one of your editors.

About People

Clinton L. Baker, Southwestern [College] at Memphis, Tennessee, has resigned as Director of the Reelfoot Biological Station, Tennessee. He will be succeeded by William Nelson, Assistant Professor of Biology, University of Tennessee at Martin. Dr. Baker, a thirty-five year veteran with the Tennessee Academy of Science will now devote his time to writing a history of the Academy.

Alma L. Luzzati has joined the Radiation Immunology Group, Oak Ridge National Laboratories, Oak Ridge, Tennessee. Dr. Luzzati received the Ph.D. degree from the University of Pavia, Pavia, Italy.

M. L. Simmons, formerly Advisor to the Experimental Animal Facilities and the Animal Testing Laboratories of ORNL has left the facility to join the staff of Smith, Kline, and French Laboratories in Philadelphia, Pennsylvania.

W. D. Wicks, Biology Division, ORNL, was in Recife, Brazil, to participate in an advanced biochemistry course at the University of Pernambuco. Afterwards, he visited laboratories and gave lectures in Sao Paulo and Rio de Janeiro.

Elliot Volkin and R. C. von Borstel, ORNL, were in Belo Horizonte, Brazil, in December, 1968, to present papers at the International Symposium on Nuclear Physiology and Differentiation.

James G. Farrelly has joined the Enzymology Group, ORNL, as a Biology Division Postdoctoral Fellow. He was granted his degree by the University of Tennessee, Knoxville.

About Institutions

As part of a continuing lecture series at the University of Miami's Research Station at Pigeon Key, Florida, Warren J. Wisby, Director of the National Fisheries Center and Aquarium, Washington, D.C., presented a public lecture. This series is a part of the Environmental Biology Program at Miami, which is under the direction of Howard J. Teas.

The Department of Botany at the University of North Carolina, Chapel Hill, has been awarded a grant of \$16,300 by NSF for conducting a research participation program for college teachers during the summer of 1969. The grant provides stipends of \$1,000 each for six post-doctoral participants and \$750 each for two predoctoral participants. In addition, each participant will receive an allowance of \$150 per dependent and a travel allowance. The program will begin June 16 and end August 23. Any teacher of biological sciences in a U. S. college or junior college is eligible to apply. Application forms and a brochure describing the program may be secured by writing the Director of the program, Dr. Victor A. Greulach, Department of Botany, University of North Carolina, Chapel Hill, N. C. 27514. The program is unique among others of the same kind elsewhere as regards the large number of professors and varied botanical disciplines provided for choice by the participants, enabling them to do research in a field that is in line with their interests and backgrounds. The professors available for directing the research of the participants are John N. Couch, Lindsay S. Olive, William J. Koch, and Clyde J. Umphlett in mycology; Max H. Hommersand in phycology and algal physiology; A. J. Domnas in plant biochemistry; Edward G. Barry, Clifford Parks, and Paul Mangelsdorf in genetics; J. Frank McCormick and Howard T. Odum in Ecology; and A. E. Radford, C. Ritchie Bell, and Clifford Parks in plant taxonomy and systematics. The goal of the program is to provide an opportunity of resumption of research activity by college teachers who have been unable to continue active investigation because of lack of time, space, or facilities.

B. Theodore Cole, Professor and Head of Department of Biology, University of South Carolina. Absorption, metabolism, and *in vitro* autoxidation of unsaturated fatty acids; effects of sodium fluoroacetate on cold blooded animal carbohydrate metabolism. AAAS; Society for Experimental Biology; Physiological Society; ASB (Executive Committee, 1960-63; Vice-President, 1965-66).

C. Willard Hart, Jr., Invertebrate Zoologist and Administrator of Consultant Programs, Dept. of Limnology, Academy of Natural Sciences of Philadelphia. Functional morphology, systematics, and biogeography of entocytherid ostracods; fresh water chemistry of Caribbean islands. AAAS (fellow); Council of Biology Editors (treasurer); American Society of Zoologists; ASB (Editor of *Bulletin* 1961-69).

Burton J. Bogitsh, Associate Professor of Biology, Vanderbilt University. Histochemistry of host-parasite relationships; systematics of flatworm parasites. Society of Parasitologists; American Society of Zoologists; ASB (Executive Committee, 1967-69).

James N. Dent, Professor of Zoology, University of Virginia. Amphibian taxonomy, development, and endocrinology; embryonic development of *Plethodon cinereus*; developmental physi-

ology and comparative embryology. AAAS; American Society of Zoologists; Association of Anatomists; ASB.

Perry C. Holt, Professor of Zoology, Virginia Polytechnic Institute. Morphology, taxonomy, and ecology of the Branchiobdellida; anatomy and taxonomy of arachnids. AAAS (fellow); Society of Systematic Zoologists; American Society of Zoologists; ASB.

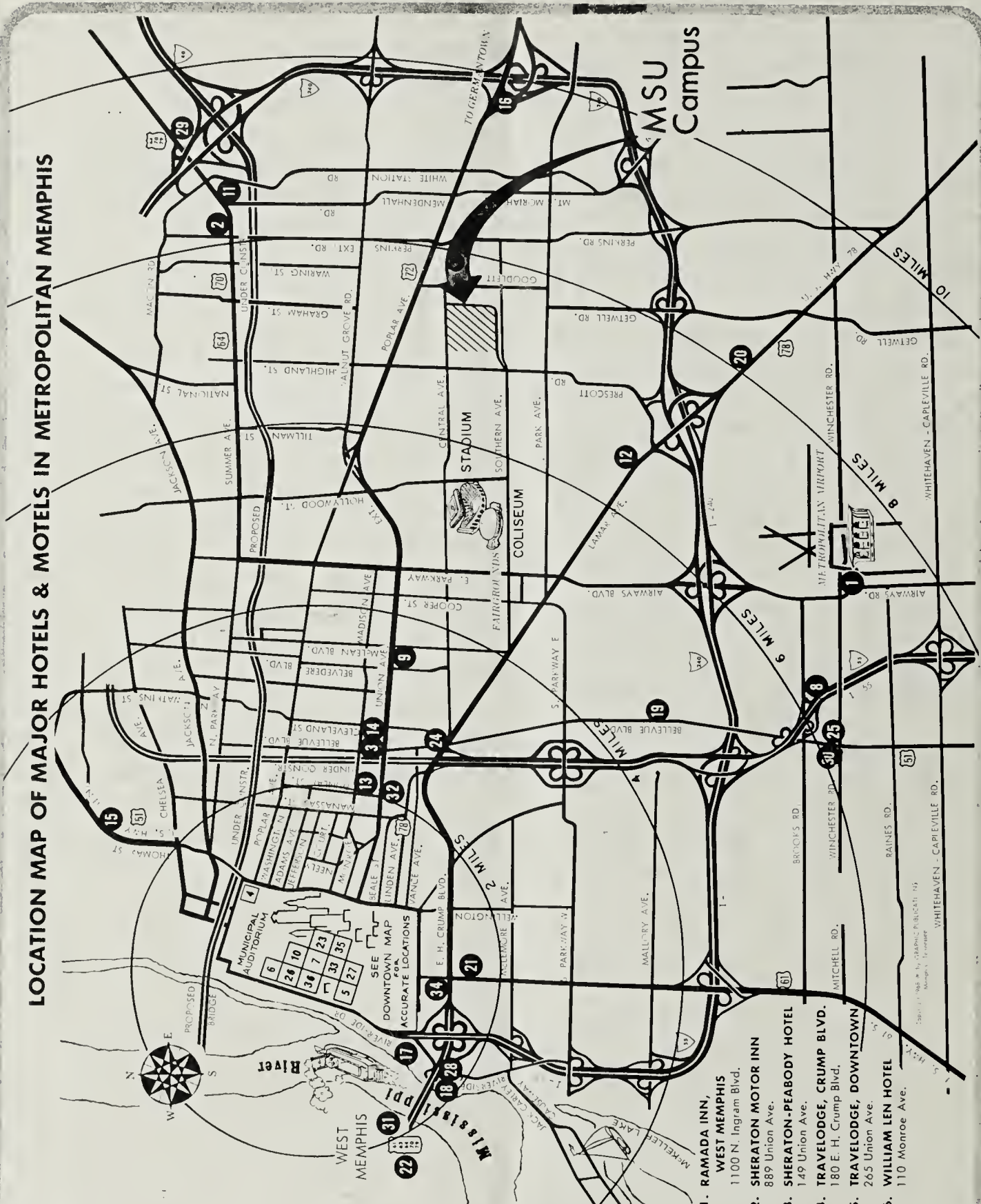
William J. Koch, Associate Professor of Botany, University of North Carolina. Culture, comparative morphology, sexuality, and taxonomy of aquatic fungi; fungi parasitic on algae. AAAS; Botanical Society; Mycological Society; Association of Plant Taxonomists; ASB (agent for incorporation, 1961-).

John H. Mullahy, S.J., Professor and Chairman of Biology Dept., Loyola University (Louisiana). Cytology of Rhodophyceae. AAAS (fellow); American Phycological Society; Botanical Society; Torrey Botanical Club; Association of Jesuit Scientists; ASB.

Charles Ray, Jr., Professor of Biology, Emory University. Cytology and genetics of *Linum* species; interspecific hybridization; cytogenetics of *Tetrahymena*. AAAS; Genetics Society; Society of Protozoologists; Genetics Association; ASB.

LOCATION MAP OF MAJOR HOTELS & MOTELS IN METROPOLITAN MEMPHIS

- 1. ADMIRAL BENBOW INN, AIRPORT
2201 Winchester Rd.
- 2. ADMIRAL BENBOW INN, EAST
4720 Summer Ave.
- 3. ADMIRAL BENBOW INN, MIDTOWN
1220 Union Ave.
- 4. ALBERT PICK MOTOR INN
300 North Second St.
- 5. CHISCA PLAZA MOTOR HOTEL
272 S. Main St.
- 6. CLARIDGE HOTEL
109 N. Main St.
- 7. DOWNTOWNER MOTOR INN
160 Union Ave.
- 8. HOLIDAY INN, BROOKS RD.
1441 E. Brooks Rd.
- 9. HOLIDAY INN, CENTRAL
1837 Union Ave.
- 10. HOLIDAY INN, DOWNTOWN
22 N. Third St.
- 11. HOLIDAY INN, EAST
4941 Summer Ave.
- 12. HOLIDAY INN, JR.
3020 Lamar Ave.
- 13. HOLIDAY INN, MEDICAL CENTER
969 Madison Ave.
- 14. HOLIDAY INN, MIDTOWN
1262 Union Ave.
- 15. HOLIDAY INN, NORTH
4022 Thomas St.
- 16. HOLIDAY INN, POPLAR-EAST
5679 Poplar Ave.
- 17. HOLIDAY INN, RIVERMONT
200 W. Georgia
- 18. HOLIDAY INN, RIVERBLUFF
340 W. Illinois Ave.
- 19. HOLIDAY INN, SOUTH
2300 S. Bellevue Blvd.
- 20. HOLIDAY INN, SOUTHEAST
3728 Lamar Ave.
- 21. HOLIDAY INN, SOUTHWEST
980 So. Third St.
- 22. HOLIDAY INN, WEST MEMPHIS
Interstate 210 Hwy. 40
- 23. HOLIDAY TOWERS
383 Madison Avenue
- 24. HOWARD JOHNSON'S, MIDTOWN
1318 Lamar Ave.
- 25. HOWARD JOHNSON'S, SOUTH
3280 Highway 51 S.
- 26. KING COTTON HOTEL
69 Jefferson Ave.
- 27. LINDEN LODGE MOTEL
176 Linden Ave.
- 28. QUALITY COURTS MOTEL
271 W. Alton
- 29. RAMADA INN, EAST
5225 Summer Ave.
- 30. RAMADA INN, SOUTH
3265 Highway 51 S.
- 31. RAMADA INN, WEST MEMPHIS
1100 N. Ingram Blvd.
- 32. SHERATON MOTOR INN
889 Union Ave.
- 33. SHERATON-PEABODY HOTEL
149 Union Ave.
- 34. TRAVELODGE, CRUMP BLVD.
180 E. H. Crump Blvd.
- 35. TRAVELODGE, DOWNTOWN
265 Union Ave.
- 36. WILLIAM LEN HOTEL
110 Monroe Ave.



By permission of Graphic Publications, Memphis, Tenn.

The ASB

BULLETIN

Volume 16, Number 3

July 1969



PRIMATE FACILITY — Duke University Field Station
for Animal Behavior Studies (See Page 98)

LIBRARY
OF THE
AMERICAN MUSEUM
OF NATURAL HISTORY

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy Crandall Bliss, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Georgia College, Milledgeville, Georgia 31061. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa.

Second-class postage paid at Philadelphia, Pennsylvania.

C. W. HART, JR.
EDITOR

DOROTHY CRANDALL BLISS
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

DAVID J. COTTER, Business Manager

OFFICERS OF THE ASB

- President — John M. Carpenter, University of Kentucky
Retiring President — Robert B. Short, Florida State University
President Elect — C. W. Hart, Jr., Academy of Natural Sciences of Philadelphia
Vice-President — James N. Dent, University of Virginia
Secretary — Dorothy Crandall Bliss, Randolph Macon Woman's College
Treasurer — David J. Cotter, Georgia College
Executive Committee —
Albert E. Radford, University of North Carolina
Burton J. Bogitsh, Vanderbilt University
Anna Josephine Bridgman, Agnes Scott College
Perry C. Holt, Virginia Polytechnic Institute
Charles Ray, Jr., Emory University
John H. Mullahy, Loyola University (Louisiana)
All officers are ex officio members of the executive committee.



CONTENTS

Association Affairs 78

The Alcovy River — A Unique Natural Heritage. — Charles H. Wharton 79

The Environmental Heritage. — John Milton 89

Paul Yokley, Jr. Receives 1969 ASB Research Award 94

William L. Mengebier Receives 1969 Meritorious Teaching Award 94

Comments on a New Genus and Species of Subterranean Fish from Alabama. — Abstract by John E. Cooper and R. A. Kuehn 95

Books and Periodicals 95

Duke University Field Station for Animal Behavior Studies. — Peter H. Klopfer 98

ASSOCIATION AFFAIRS

Notice of Positions Available for Undergraduate or Graduate Students

Employers are urged to submit notices regarding job opportunities for undergraduate or graduate students in biology to The ASB Bulletin. Notices of summer employment are particularly requested. Send information to the Editor as soon as available. Include information on where, when, description of work, salary, length of time, type of training required, etc.

The Alcovy River - A Unique Natural Heritage

CHARLES H. WHARTON
Georgia State College

Prologue

Foremost among the things which can destroy this nation is the failure to recognize and teach the true relationship of man to the natural world. The most shocking manifestation of this is the abuse and destruction of our natural environments of air, water, and land. Lately it has become manifest through the ecologist Eugene Odum and his associates that a combination of water and land, the coastal marsh, is of critical importance. Another combination of water and land, the inland swamplands, perhaps lacking so significant a champion, and with far less data in their behalf, have nevertheless come to their time in history.

This report is written in behalf of the larger river swamps of the Southeast, those mysterious assemblages of water and forest, the wet and the unwet, that have intrigued naturalists and explorers from 1791 to 1969. From the days of William Bartram, who found and lost the gorgeous *Franklinia* in the great Altamaha swamps, we have hardly known how to treat this quite conspicuous and little understood feature of our natural environment. To the average man the word "drain" was the major verb to apply to this watery realm that was neither fish nor fowl. Forlorn ditches and abandoned canals over the state attest the lack of appreciation and understanding of these wetlands. The mighty Okefenokee but narrowly escaped the fate of drainage brought by ditch, canal, or channel; the vast Everglades has come close to death by the same means.

Today, a deepening and widening of swamp streams by bulldozer and dragline, called "channelization" threatens the remaining fresh water river swamps of Georgia. Channelization is a part of nearly every flood control project of the Soil Conservation Service under Public Law 566. Because P.L. 566 projects have been largely confined to small watersheds, the channelization of larger Georgia streams has not been attempted. Proposed channelization of the large Alcovy River in Newton and lower Walton Counties has abruptly brought this facet of flood control in conflict with ecologists, conservationists and resource management agencies. Not only would channelization destroy the Alcovy's position as a state scenic river, but it would jeopardize one of the state's few remaining natural areas, the potential of which is of value to every citizen in Georgia.

Small bottomlands, on streams small enough to have been manageable by the beaver, the Indian and the Caucasian settlers, are not the issue. We here are concerned with the large swamp ecosystem, too large to be mastered by man or animal, that has existed in a relatively stable state for centuries. These great river swamps were likely the last refuge of the vanished mastodons, mammoths and ground sloths who, incredibly, appear to have survived here until as late as 2000 years ago. Today these swamps are the last refuge for a dwindling host of native fauna, including the cougar, red wolf and Ivory-billed Woodpecker.

I thus offer constructive criticism of only one phase of Soil Conservation Service activity, the

interpretation of P.L. 566 as regards channelization of the larger swamps along the larger streams. No opposition is intended against flood control reservoirs, protection of land being farmed or having been farmed, or other sound aspects of the Alcovy Project.

Introduction

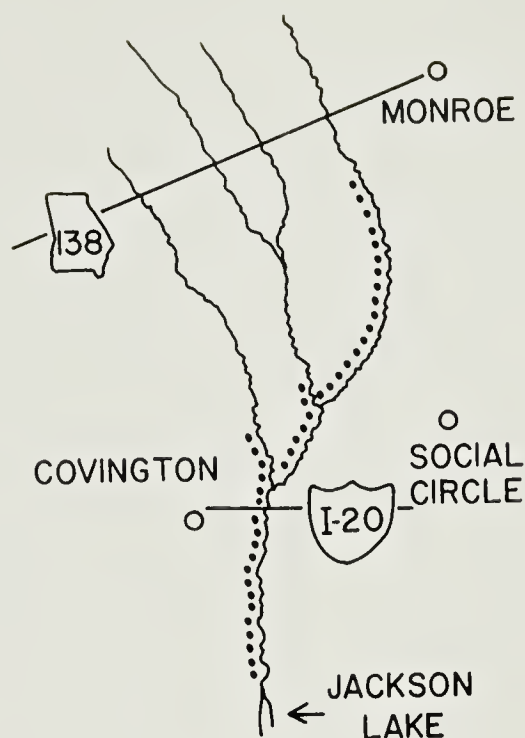
The Alcovy River is a branch of the Ocmulgee, and the easternmost of three large rivers draining into Jackson Lake. Above Jackson Lake are impressive shoals and the fall is most rapid. From about four miles below Covington north to Monroe the river is bordered by some of the finest bottomland swamps in the Piedmont. Where standing or flowing water is abundant, there are numerous stands of tupelo gum (*Nyssa aquatica*), a coastal plain species. Infrequently flooded portions of the swamp bear a floodplain assemblage of water oak, swamp chestnut oak, sweet gum, hackberry and poplar. Occasional high bluffs border the river with beeches and mountain laurel. Among the larger vertebrates, water fowl, deer, raccoon, otter, beaver, mink, swamp rabbit and squirrel are often abundant. The forest floor supports a rich assemblage of smaller vertebrate life. Among the amphibia are Ambystomid salamanders (spotted and marbled), two species of *Eurycea*, *Hemidactylium*, *Pseudotriton*, the golden mouse (*Ochrotomys nuttali*) and in the high swamps and ecotones, the rare southeastern shrew, *Sorex longirostris*, and the jumping mouse, *Zapus hudsonicus*. The southernmost locality for the northern meadow mouse, *Microtus pennsylvanicus*, was discovered adjacent to the swamp by Homer Sharp on Sam Hay's property south of Covington. The swamp pools swarm with invertebrate life even in winter. Current studies are underway on food chains in the Alcovy swamp but relatively little is known of this prominent ecosystem. The Alcovy itself is clean and unpolluted compared to other Piedmont streams. It is perhaps unique among Piedmont rivers in the vastness of its swamps, the nature of the swamps, and in having an accessible and central location. We at Georgia State use the Alcovy for field trips and have found it very convenient to an institution in urban Atlanta. Further, its cleanliness offers us a research control in comparative

studies of the swamp ecosystem of the South River, now virtually an open sewer. River basin studies are an important phase of the current International Biological Program. Between Monroe and Jackson Lake the Alcovy provides unexcelled wilderness experience in hiking, boating, hunting, fishing and general natural history. The quality of its water and its environment of plant and animal life makes the river a valuable candidate for the state scenic rivers system.

The area of the swamp lying south of the Alcovy Station railroad trestle has been calculated by planimeter from U.S.G.S. quadrangles to be 1825 acres, and is of the most crucial importance. Complete U.S.G.S. coverage is not available in Walton County but the area from the railroad bridge north to Monroe has an estimated 1500 acres of river swamp.

The Alcovy Project

The Soil Conservation Service, under Public Law 566, has very recently completed plans for a project which is intended to eliminate 80% of the swamp forest along the Alcovy and two principal tributaries, Cornish and Flat Creeks. This project is sponsored by the Upper Ocmulgee Soil and Water Conservation District and city officials of Monroe, Covington and other communities. About 15 reservoirs are to be constructed. Two are large, the largest having a normal pool of 560 acres, a flood pool of 1235 acres. The present Alcovy channel is to be dredged from five to six feet deep (published plans for Cornish Creek, Flat Creek and the lower Alcovy call for a cut below grade of from 4.0 to 8.5 feet); the spoil may be spread or not spread at the landowner's wishes. Cornish Creek will be dredged from its junction with the Alcovy (5.5 foot depth to top of bank) to Highway 138 (4 foot depth here). All trees will be cut on one or both sides of the river and tributaries in a strip from 30 to 100 feet wide to make it easier to deposit the dredging spoil and to prevent trees from falling into the river. The present channel of the Alcovy is to be followed in dredging. In certain areas the channel will be widened as well as deepened. On Cornish and Flat Creeks old dredge lines will be followed. From the terminus of the present large swamps about a mile above the highway 213



The Georgia map (left) indicates the extent of Small Watershed Projects of the Soil Conservation Service as of Dec. 31, 1968. Solid black area is the coverage of the Alcovy River - Cornish Creek Projects. Stippled areas are other S.C.S. flood control projects classified as follows (some are Pilot Watersheds, most are under P.L. 566): Completed, 22; approved, 41; submitted for approval, 103. On the right is an enlargement of only a part of the Alcovy River - Cornish Creek Projects; the proposed Alcovy Seenie River is shown as a heavy dotted line.

bridge to about six miles downstream, snagging and clearing of the river will be done. The costs of the project on the Alcovy proper will be \$6,003,032 of which \$3,909,874 are public funds. The costs of Cornish Creek are \$4,860,009 of which \$3,196,910 are public funds. The stopping of erosion, the reduction of flood-frequency on existing croplands, and the impoundment of water for late summer use by cities downstream are all worthwhile objectives of the Alcovy Project. *Disagreement comes only with channelization of the lower Alcovy below Monroe and in certain parts of lower Cornish and Big Flat Creeks.*

The evidence is strong that channelization of the Alcovy will destroy a very valuable resource, not only for the owners of the river, but for the people of the entire state. Serious confrontations between conservation, game and timber resource people and the advocates of P.L. 566 have

occurred, chiefly over the disastrous effects of channelization. Weaknesses of P.L. 566 programs have been summarized by Poole¹ of the Wildlife Management Institute indicating that, in many states, "engineers, economists and physical scientists are making irrevocable biological decisions affecting irreplaceable resources". Stuart² has presented an analysis of P.L. 566 recommending elimination and reduction of channelization. Russell³ of Kentucky Fish and Wildlife Resources has discussed the catastrophic effects of 566 projects indicating that "... lowland wood-

¹ Poole, Daniel A., Weaknesses in the Public Law 566 Watershed Program, presented at the 15th National Watershed Congress, Louisiana, May 27, 1968.

² Stuart, Russ, An Analysis of Public Law 566, presented at the N.W.F. meeting, Las Vegas, Nevada, March, 1964.

³ Russell, Dan M., Wildlife and P.L. 566 Watersheds, presented to State Soil Conservation Staff Conference, February 25, 1963.

land habitat comes the nearest to a multiple use concept of any wildlife environment. Its utilization by important furbearers, waterfowl and for its timber resources make it doubly valuable from the monetary and recreational standpoints." "We in Kentucky have found that wildlife habitat destruction far outweighs any possible benefits under the P.L. 566 programs."

Barick⁴ reported to the Southeastern Directors of Wildlife Commissions that his study group examined nine streams channelized by P.L. 566 projects and detailed the impact on swamp hardwood tree production. "Participants observed clear cut evidence of tupelo gum damage and destruction through excessive water removal and right of way clearing. Expert opinion expressed indicated that excessive lowering of water tables would result in tupelo die-back and that this valuable species would be replaced by other less valuable species. In the course of our tour we gained additional information supporting our belief that desired agricultural drainage could be secured without destroying the valuable wetlands, since the present drainage design is based upon the erroneous assumption that these areas have no significant value." Barick's group consulted with drainage engineers and found that modification of former procedures was indeed practical. Forest Durand,⁵ while director of the Tennessee Game and Fish Commission, expressed the growing concern held by many state agencies dealing with conservation of natural resources (including Georgia officials), that P.L. 566 projects are very questionable where the resources being lost are in short supply and increasing demand while those gained are already in oversupply. Durand points out that channelization and stream alteration appear an easy way to arrive at satisfactory cost benefit figures as required by law. Director Durand challenged the current idea of getting water that can not be put behind dams off the watershed as soon as possible, reversing the past philosophy of holding it there, a philosophy which had originally helped enact P.L. 566.

⁴ Barick, Frank, Tour of Small Watersheds (P.L. 566) Projects in North Carolina by Special Study Committee of Appalachian Section of S.A.F., June 17, 1964.

⁵ Durand, Forest, presented to North American Wildlife and Natural Resources Conference, Detroit.

Bayless and Smith,⁶ in a study of habitat alteration associated with stream channelization in eastern North Carolina, compared the fish populations of 23 channeled and 36 unchanneled streams and found 90% reduction in weight and number of game fish per acre in streams channelized by P.L. 566 projects. For a 40-year period following channelization fish and wildlife populations did not recover. Allen's⁷ report on channelization's impact on fish and wildlife revealed that all 13 southeastern states felt that channelization posed a serious threat. In addition, Kentucky reported erosion and slumping in 60% of P.L. 566 channels inspected. Leonard Foote and I found serious slumping in the Little River channel emptying into Lake Allatoona. Unfortunately, owing to the uniform and faster current created by channelization, this material is not redeposited locally but swept far downstream into the lakes. In naturally meandering streams, soil that may erode on the outside of bends is redeposited on the inside of other bends. Departments of some states, such as Florida, have urged repeal of P.L. 566. South Carolina suggested that important ecological types and areas be placed in a "hands off" category. Ecologists and agency specialists of the Georgia Natural Areas Council have the responsibility of establishing a classification of Georgia environments and of declaring their public value as soon as possible.

Ecologists and wildlife specialists were criticized at a public hearing on the Alcovy because they had supposedly waited 10 years to make themselves heard. A letter from the Georgia Game and Fish Commission dated March 4, 1968, states that the Commission is not made aware of a project until it is already approved and that recommendations for modification of stream channelization are entirely ignored. While a preliminary work plan map on the Alcovy was prepared as early as 1960, feasibility studies by

⁶ Bayless, Jack, and William Smith, The Effects of Channelization upon the Fish Populations of Lotic Waters in Eastern North Carolina, North Carolina Wildlife Resources Commission, Raleigh.

⁷ Allen, Ralph H., A Summary Report on Channelization and its Impact on Fish and Wildlife Resources to the Southeastern Association of Game and Fish Commissioners, Alabama Department of Conservation, Montgomery, 1968.

Service engineers were begun in 1963, stopped in 1964 due to reservoir limitation figures, and not resumed until 1967 when P.L. 566 was amended to raise the size of reservoirs from 5000 to 12,500 acre feet. According to the S.C.S. itself complete finalized plans for the Alcovy Project have been made available only in the past few months. It has therefore been difficult even for agencies on the inside of these projects to have known what was intended prior to 1967.

Alabama's chief of Game and Fish, Kelly,⁸ indicates that channel construction alone usually costs several times more than the market price of the land alleged to be benefited, and that "a closer look reveals that in almost all instances the amount of money to construct the channel, if placed in savings at the current interest rate, would more than pay for annual losses of each landowner, incurred as a result of floods."

According to the work plans it would appear that 4,327 acres of swampland could be drained for creating additional farmland. This is directly against administrative policy set forth in para. 101.101 - 101.103, Chap. 1, Part 1, *Watershed Protection Handbook*, S.C.S., U.S.D.A. which states "No P.L. 566 financial or technical assistance will be provided for projects in which monetary benefits accrue primarily from bringing additional land into agricultural production." Charles Elliott, writing for *The Atlanta Journal* (Outdoors and Recreation, March 9, 1969), says that he fails to understand how we can pay landowners to put their agricultural land in the federal soil bank and then expend federal funds to give them more agricultural land.

Even if the acreage cited above could bring private monetary gain the cost to the public is prohibitive. According to a statement issued by the Georgia Game and Fish Commission February 27, 1969, "These plans say the annual benefits of this will be worth \$105,000 a year. Channelization costs . . . to accomplish this would cost almost three million dollars, which could mean that it would take almost 30 years for the benefits of drainage to match the cost. By that time, the future recreational and educational uses of

the swamp lands might exceed their value to the public as drained land"

Something is fundamentally wrong when any organization can, without basis in sound ecological study, destroy a large life system (ecosystem) of great potential value to its owners and to the people of the entire state. It is fundamentally wrong to expend public funds to help private citizens, while the pleas of public agencies and professionals are ignored. The implications of the Alcovy go far beyond this river. Projects under P.L. 566 nearly blanket Georgia's Piedmont. Unless true cooperation on channelization soon occurs between the S.C.S. and other state and Federal agencies, there will be no scenic rivers left in Georgia and the esthetic, educational, scientific and recreational benefits of many streams will be lost for generations to come. The children of the present landowners have to live in the environment which we leave them. At the heart of the matter is the fact that many landowners have derived no monetary yield from their swampland and are being taxed as highly on it as they are for high ground which can be developed or cultivated. We must acknowledge this problem. We must indicate ways to get tax relief for swampland and point out how it may be profitable to keep swamps in their natural state. The remainder of this paper seeks to set forth the significance of the living swamp in its unchanneled state, followed by reasons why landowners should maintain their swamp in a natural state.

The Alcovy in Education and Science

Since uplands, fields or forest are increasingly involved in subdivision and commercial enterprise, they are rapidly becoming scarce making it increasingly difficult to establish areas where school children and college students may learn on field trips the fundamental relationships between water, soil, plants and animals. The river swamps provide ideal natural laboratories, being generally available to almost all urban centers. The rich life system of the Alcovy is centrally located to serve a vast urban population, providing no channelization is done and the river can be set up under a state scenic rivers bill or established as a natural area by the State Natural

⁸ Kelley, Charles D., personal communication dated February 21, 1969.

Areas Council entering into agreement with the owners.

Natural areas, such as the Alcovy bottomlands, are important to education in Georgia. Undirected education, such as the boy-swimming hole - cane pole - dog association, can be a very important educational experience. Channelization also makes it extremely difficult to teach the fundamental concepts of man and nature to school children, by depriving them of a comparatively inexpensive local environment which is available to many communities and which is *not* in demand for construction and development. The river swamps have all the attributes of natural outdoor laboratories — all our cities and towns desperately need these areas within an afternoon's bus ride.

The role which the life system or ecosystem of the swamp plays in maintaining water quality and in productivity and other basic questions requires that a large natural swamp such as that on the Alcovy be available for basic studies to provide answers of regional importance to all watershed management where the larger swamp forests are involved. The Alcovy swamp is centrally located to major universities and colleges. There is currently underway an International Biological Program to investigate the life systems of the earth. Inland wetlands are perhaps the least understood division of the Eastern Deciduous Forest Biome. Emory University is concentrating its efforts on the Altamaha system, primarily the granite outcrops and coastal estuary. Shorter College is investigating the occurrence of southern plant species in northern Georgia. The University of Georgia is concentrating its large facilities on major dry environments of forest and field. Georgia State is currently investigating food chains and ecology in the river swamps, including the Alcovy. Some very basic questions can be conducted in the Alcovy swamplands. Through sediment studies, C^{14} dating and pollen analysis questions as to the age of the swamps and historical hydrology may be answered. Such questions as the course and rate of sedimentation, changes in river channel and tree composition are vital to future planning involving river swamps. Effects of old channelization on the Alcovy, Big

Flat, and lower Cornish Creeks need to be evaluated.

Existant croplands now flooding and likely to be aided by the Alcovy project lie on the headwaters of the Alcovy and Cornish projects, not within the larger swamplands. Attempting to drain the large swamps will not then prevent flooding of existing farmlands. Normally, in flood time, water spreads slowly out through the large swamps, some of it sinking into the ground, with the result that the head of floodwater is much reduced, and both rise and fall may take several days. Channelization would seek to hurry the water downstream making problems below and allowing the velocity of the water to carry sand and silt downstream in unprecedented magnitude. The 566 project will not prevent floods — it only lowers their incidence from yearly to every 3 years. Floods can come for several straight years or there may be several dry years in a row. Channelization is not designed to cope with the heavier floods which come with a probability cycle of every 5, 10, 15, 25, and 50 years. These heavier floods can come during any year. Any farming or fencing of bottomlands of the Alcovy is therefore done at considerable risk.

S.C.S. 566 projects are concerned with water quantity, not quality. The larger river swamps act as effective filters, depositing their silt loads over a large area, cleaning the river as it flows. With channelization much of the suspended material has no opportunity to settle out, the higher velocity of the water can carry it into Jackson Lake, which may rapidly become eutrophic and sterile, destroying particularly the Alcovy arm, which is the cleanest part of the lake. One has only to compare the turbidity of a channelized stream such as Little River emptying into Allatoona with the Alcovy. The river swamps act not only as settlement basins for suspended matter, but probably function as natural oxidation basins, purifying the water of pollution. Tim Douglas' work in Pennsylvania showed that where sulfate wastes were pumped into woodlands, the streams coming out were purer than the effluent from the best sewage treatment plants. Ed Hall, biologist of the State Water Quality Board, told me that he was astonished at

how the Flint River cleaned itself in the swampy stretch between Atlanta and Griffin.

Some ecologists suspect that the larger swamps may act in the natural regulation of water, absorbing it during the wet season and feeding the stream during the late summer and fall. The water-storage capacity of the Alcovy Swamps may be dependent in part on the water level within the main stream. Studies indicate that beaver ponds increase the ground water beyond their limits. A study at the Coweeta Hydrologic Station revealed that 24 inches of water poured daily onto the forest floor at the head of the stream in June and July, materially raised the stream flow at lower elevations during the dry months of September and October.

Productivity is measured in terms of the plant and animal life which the river swamp can grow. Although we lack data in this regard, Leonard Foote and other ecologists feel that the river swamps are very probably the most productive environments in the state. The fertility brought in by flooding, and that added by decaying organic material in the swamp itself are responsible. Thus these areas can grow timber rapidly and produce mammal, bird and fish life which can be harvested. Why export this fertility to Jackson Lake by channeling the river, when it can be used locally, Rick Foote took a five mile float trip down Little River before it was recently channeled and counted 300 mallards and black ducks. We have already seen that there is no comparison in fish productivity between channeled and unchanneled streams and that the growth of gum trees is dependent on the height of the water table and standing water. The channeled stream presents a dismal picture, its steep banks and constantly rolling sand bottom provide no foothold for the beginning of a food chain to support vertebrate life. Few fish can maintain themselves in a channeled stream. The tracks of muskrat, mink and raccoon will often be sought in vain along its edge. I have seen this tragic situation on Gum Creek in Newton County, channeled some years ago. Unless the landowner does much prompt side drainage, desirable trees die and impenetrable marshy areas are produced. Tree succession often appears to favor the undesirable river birch and frequently

areas are covered with tangles of honeysuckle, privet and briars. In contrast, the swamp pools and ox-bows of unchanneled streams teem with life even in mid-winter, providing a stable basis for food chains involving fish, turtles, raccoon, mink and others. The tupelos, oaks, hickories, holly and innumerable grape vines provide food for a wide variety of birds and mammals. The Alcovy swamps are the refuge for a large tri-county deer population. The river swamps provide a greater variety of life than any other Piedmont habitat. There are no grounds for swapping this variety of quality game, fish, birds and mammals for more quail-cottontail habitat, already in abundance.

Recently the unlimited use of pesticides, and air and water pollution has vividly brought to focus the utter dependence of man upon his natural environment, no matter how deep within the levels of a modern city he may try to hide. Society can no longer ignore ecological principles — ecology is now really human ecology — and basic to our survival as individuals or as a nation. The relatively young discipline of ecology (the relation of life to the environment) has been strained to produce practical results of application to our burgeoning populace. Scientists have discovered in the nick of time that the vast expanses of what appeared to be useless marsh grass along the Georgia Coast was, in reality, a factory making food for millions of tons of shellfish and fish in the marshes and along the entire continental shelf of the state. Our factual knowledge of the function of the great river swamps, such as those of the Alcovy, is too meager to warrant their demise at this stage of human history.

People are reawakening to the startling fact that modern man, with all his technical genius, is scarcely better off than the pioneers. To them, at least, vast stores of unplundered soils and forests had yet to yield their richness. Need we destroy every vestige of the natural environment that may remain?

The winds of change have swept across the U.S. Army Corps of Engineers. According to Weathersbee⁹ the Corps is receiving the "scorn

⁹ Weathersbee, Christopher, The New Corps, *Science News*, Vol. 95 (1), February, 1969.

of a growing segment of the public which is desperate over the careless exploitation of natural resources." In April the Corps sent a circular to its engineers calling for the unprecedented consideration of non-construction alternatives in flood control planning. Despite billions spent on dams, annual flood losses continue to rise. The answer may lie "in simple zoning controls to keep construction off areas likely to be flooded while preserving the flood plain as a park." The Corps of Engineers has decided to make environmental quality, including both esthetic and ecological considerations, an additional primary objective.

Ecologists and conservationists of the state of Georgia would very much like to see officials concerned with P.L. 566 include among their objectives esthetic and ecological considerations; it is only in this re-recognition of man's true relationship to his natural environments that the quality life we demand will be satisfied. Our survival as a viable state and nation asks each of us to recognize this relationship to natural environments and participate in their preservation or lose not only our leadership in the world community, but our life.

Profitable Management of Alcovy Swamplands

The landowners who own the swamp in the vicinity of Covington have large holdings, and few appear to have any plans for the swamp. All appear to realize that it could never be commercial or residential property. All of these men seem to know that subdivision from residential expansion will, in a few years, bring such a return from the high ground, that the cost of clearing the swamp lands for possible pasture would hardly be worth while for the few years of yield that could be expected before they sold or developed their high ground. Only one owner would like to try farming some of this bottomland. He is apparently willing to take the risks and is prepared to invest in the necessary side ditching and care that would be needed to maintain this high-risk farming. It is not evident that landowners adjacent to the larger streams are enthusiastic about claiming bottom land.

Few follow-up studies appear to have been made on P.L. 566 projects. Leonard Foote

(Wildlife Management Institute) indicated that on projects he has visited, he has seen only one example of a landowner trying to reclaim what had been large swamp forest. Too often, the effects of clearing and side ditching the larger bottoms appears to be offset by the accumulation of rainwater abetted by insufficient drainage, the normal lack of slope and the high berm of dredging spoil. These bottomlands converted to pasture frequently present the landowners with the invasion of inedible sedges, rushes and unpalatable, vigorous weed growth which is difficult to control because of the bogging down of machinery. Small wet places gradually coalesce into larger areas and are often abandoned. Normally, beavers do not attempt to dam streams as large as the Alcovy or the side streams in the flood plain forests. The spoil banks along a dredged stream, however, may stimulate beavers to dam side streams. The landowner should be prepared for their depredations.

What the Alcovy and Its Swamp Forest Can Mean to the Landowner

Providing that the channelization of the Alcovy and lower tributaries can be avoided, there are a number of approaches that will profit the landowner more than trying to reclaim terrain still subject to periodic flooding. These land use projects are outlined below.

(1) Help establish the Alcovy as a Scenic River at a state or national level. This would vastly increase the value of the wetlands adjoining the rivers as well as increase the tourist income of Covington, Monroe, Social Circle and the entire tri-county area.

(2) The individual landowners can protect the plant and animal communities of the Alcovy swamplands for purchase by groups, agencies and organizations for use as natural areas maintained for educational and scientific purposes, river parks, etc.

(3) The individual landowners can have access to lawyers in conservation groups who can assist them in obtaining tax relief. There is the possibility that property may be leased for educational purposes and that the fair rental value can be deducted from income tax, resulting in a saving that will offset ad valorem taxation. The

giving of a scenic easement also has advantages in income tax reduction and reduced tax valuation of the property involved. One Newton County landowner, by showing land value figures provided by Georgia Kraft, was able to get the County to lower the valuation of his swamp land from \$85.00 - \$89.00 to \$60.00 per acre. It should be pointed out that swamp drainage may raise the landowner's taxes whether or not they can profitably farm any of the bottomland. There is, on the other hand a very excellent chance of having valuations lowered or eliminated by the proper type of use.

(4) Individual landowners can protect their swamps, managing them as natural areas, and derive an income from paid hunting, fishing, boating and camping. Paid camping, hunting and fishing and other outdoor recreation have seen fantastic recent growth. It is one of the opportunities of the future. The high productivity of ponds and of ox-bow lakes in river swamps is well established and growth rates are high.

(5) The "green belt" of the Alcovy River swamp will enhance the value of adjacent dry lands. The esthetic beauty and the wildlife of swamps along the Alcovy and Cornish Creek has already proven a substantial asset to subdivision. The beauty of swamps has brought to one wise landowner a group of purchasers who cherish this wild resource for hunting, fishing, but chiefly for *personal esthetic enjoyment*. As urban sprawl gobbles real estate, the swamp green belt more and more enhances the environment of housing and industry. Do not underestimate the lure and attractiveness of swamps to many people, particularly urban dwellers to whom a small piece of wild America can be a treasure of enjoyment.

Epilogue

Unless you spend much time in the field, the impact of the S.C.S. watershed projects may well have escaped your attention. In the Piedmont, a diminishing agriculture has led the S.C.S. to turn to flood control to maintain its power structure, and major planning has fallen into the hands of engineers. As biologists and ecologists who must work and live in the Southeast, it is our responsibility to help the S.C.S. find new values

for cost-benefit ratios necessary for reservoir construction. Would it not make better sense to have these reservoirs protecting the swamplands from excessive water loss during dry months, than to try and prevent natural flooding, which is what the riparian swamps function upon? Or, could not the S.C.S. turn its talents and millions to rebuilding the organic horizon, now that what's left of the soil has been relatively stabilized from erosion, and thus make one enriched acre yield the equivalent of five? I challenge you, the scientific community in life and earth sciences in the Southeast, to lend your talent to save a significant American environment in its penultimate hour of life.

This is not a problem unique to the Piedmont. In the Coastal Plain few reservoirs are built — *channelization is the major method of flood control!* Whether its tupelo honey, alligators, crayfish, froglegs, muskrats, green turtles, catfish, or anadromous fishes such as shad and striped bass, coastal plain streams have even more to lose from an economic standpoint. No stream is too large or too small to escape. One has only to read Grits Gresham's *Atchafalaya Basin Crisis* to learn the stunning news that 1300 square miles of unique, irreplaceable wildlife habitat in Louisiana is in serious jeopardy by channelization. (In this case, by the U.S. Corps of Engineers).

It would be pleasing to see the S.C.S. recognize the multiple-use concept so effectively applied by the U.S. Forest Service, and put positive values on the southern swamps. Few of us relish the negative approach of calling the American taxpayer's attention to the fact that his dollars go to destroy an environment he needs for wildlife, recreation, education and science; that his dollars enhance land values for a few riparian owners; that he is helping put more land into agriculture while paying to keep it out of use and avoid higher crop subsidies, and that he is supporting a local enclave of landowners who can sponsor and vote on federal projects which will bring them financial gain.

If you are interested in this problem in your state you might: 1. familiarize yourself with S.C.S. watershed projects from your state's headquarters 2. contact your game and fish depart-

ment or other department concerned with environments and discuss the local impact of channelization 3. make your wishes known to your representatives in House or Senate and ask them to attend hearings on agricultural appropriations.

We in Georgia are taking four additional steps:

1. A citizen's group, The Georgia Conservancy, is requesting that a senator seek the views of the Secretary of Interior; this will allow the federal agencies (Fish and Wildlife, Bureau of Outdoor Recreation) to make firm statements of position.

2. The Georgia Conservancy is writing President Nixon in his capacity as Presiding Officer of the Environmental Quality Council, asking that the Council both review and study the Alcovy plans as they affect natural beauty and outdoor recreation under para. 8(b), Executive Order 11472, dated 29 May, 1969.

3. Representatives of citizen's groups will travel to Washington and meet as a group with Secretary of Agriculture Clifford Hardin, request-

ing a moratorium on the Alcovy-Cornish Creek Projects until it has been demonstrated that channelization here is in the national interest.

4. The Georgia Conservancy is raising money to hire a competent economist to make a thorough, independent economic appraisal of the Alcovy-Cornish Creek Projects.

If you would have a natural scenic area of significance to yourself, your children and to fellow Georgians, I urge you to contact a Director of the Alcovy River Watershed Association, the County Commissioners of the cities and counties involved, or other officials, asking modification of the Alcovy project *only as regards channelization in the lower parts of the watershed*. One can cut a forest and eventually it will return. It is doubtful if channeled areas can recover their natural conditions within several lifetimes, if ever. Therefore, any decision that you make goes far beyond the few years during which some temporary local profit might be secured.



The Environmental Challenge

An Invitational Address to the Association of Southeastern Biologists Annual Meeting
April 20, 1967, at the University of South Carolina, Columbia, South Carolina

John Milton, Deputy Director
Division of International Programs
The Conservation Foundation
1250 Connecticut Avenue, N.W.
Washington, D.C. 20036

The land area of the world is relatively constant and fixed, but the number of people who live on it and the impact of their technology is increasing rapidly. The total world population is today about 3.3 billion and is presently growing at a rate of about 2% per year; if continued, this rate of increase will double the planet's population in 35 years. For the over two billion people of the developing countries, this rate of growth continues to accelerate, with little evidence of any slowdown. Even if world population were already stabilized, the tendency to aggregate in great urban clusters would doubtless continue, causing increasing human impact on the urban-suburban fringe.

This is also an age of the information "explosion," the communications "revolution," and profound permutations in technology. All of these alterations are radically transforming the physical landscape. Part of our difficulty in comprehending the scope of our environmental dilemma lies in the speed at which many of these changes in technology are occurring. We simply often do not have time to assess their effects upon the environment—and an understanding of the cumulative effect of all forms of environmental change seems far away, indeed.

In this age of the computer, the systems analyst, and the subsidization of national goals like the landing of men on the moon, where does an endangered species fit? How do we compute the aesthetic value of a vanishing natural habitat?

Perhaps, instead of supporting increasingly costly expenditures for the exploration of space, we should begin to look more closely at the patterns and processes man and nature have formed on earth. The late Adlai Stevenson once remarked:

"We travel together, passengers on a little space ship, dependent on its vulnerable reserves of air and soil; all committed for our safety to its security and peace; preserved from annihilation only by the care, the work, and, I will say, the love we give our fragile craft."

This statement displays an insight which many of our present statesmen might well attempt to apply. Today only a tiny fraction of the United States' national budget is spent on the administration of our natural resources. Major decisions affecting our country's future environment are made primarily on the basis of cost/benefit analysis and/or political expediency and not on the basis of sophisticated understandings of resource ecology leading to long-term social benefit.

Much of the responsibility for this situation lies with the ecologist himself. Most of us involved in the natural sciences, and particularly in ecology, have failed to undertake scholarly long-term investigations into the various impacts of new technologies on the natural environment; similarly, we have failed to effectively communicate our results to the key decision-makers affecting nature. Without any viable counter-arguments, commercial interests are usually able to apply new technologies for short term economic gains; the potential long range contribution of the biologist and ecologist often is lost by default. As Dr. Stanley A. Cain, Assistant Secretary of Interior, recently put it:

"We generally have utilized our rapidly growing scientific knowledge in the performance of specific and largely short term objectives with little or no concern for the side effects of our actions. Stated boldly, this is a serious accusation because it implies that the loss of quality of the physical environment has been a consequence of this narrow vision."

This, then, seems to be one of our key problems: that our industrial-technological society is

geared mainly to specialized, single-purpose activities — many of which have led to significant advances in specific facets of our culture — but our society has not yet proved itself capable of dealing with the long-term cumulative ecological effect of multiple environmental changes. Dr. Cain goes on to say:

“At long last, the heedless devotion to material progress, despite its many benefits, is bringing a realization that analysis must be balanced by synthesis, that specialization must be limited by generalization, and that commodities and marketable services cannot be equated with and replace real values which are intangible.”

The specific problems symptomatic of the short-range, single-purpose approach are manifold; to mention only a few of the better-known examples: air and water pollution by chemicals and sewage; indiscriminate use of broad spectrum pesticides; soil erosion and structural deterioration; synthetic chemical, organic and thermal pollution of waters in lakes, rivers and estuaries; noise pollution in our major cities — now about to be compounded by development of supersonic air transport; contamination of the biosphere by nuclear wastes — a growing problem as peaceful application of atomic energy increases; destructive introduction of exotic organisms, both accidental and intended; insufficiently guarded use of new drugs and chemicals, as in the case of thalidomide; international assistance to support public health activities in lowering death rates without simultaneous and coordinated assistance to lower birth rates; direct physical destruction of important natural habitats by dredging, filling, bulldozing, and related activities; unplanned urban-suburban development into sites subject to natural constraints (such as floodplains, and major aquifers) or into areas of outstanding scientific or aesthetic value as open space. In each case, these activities are undertaken to fulfill a specific need, an immediate request, a quick answer. Clearly, other answers are needed.

As indicated in an earlier part of this paper, the ecologist, biologist and natural scientist bears much of the responsibility for changing the existing pattern of resource use by providing new data based on synoptic, long-term investigations of natural ecosystems as they are affected by various technologies. In order to do this, we will also need to preserve complete natural area systems

representative of the nation's full range of natural ecosystems. Such areas are essential for training and observational (and, where necessary, manipulative) research into how differing undisturbed environments work.

The role of natural area preservation is a vital one for environmental research. These reserves provide important living laboratories against which we can measure the complexity and extent of man's technological impact on similar ecosystems elsewhere. As the scope and severity of environmental change accelerates, these protected natural areas will grow increasingly valuable to science. Hopefully, with the help of such efforts as the International Biological Program (IBP), the number and variety of research projects undertaken on research reserves will grow.

One of the main objectives of this international undertaking, which hopes to determine the biological basis for productivity, will be to support a series of intensive, multidisciplinary, and synoptic analyses of ecosystems. The preservation of large natural areas typical of each major ecosystem type is an obvious and essential first step to any such effort. The IBP will also attempt to insure an adequate distribution of intensively managed research reserves. Without this location and protection of research sites, the researcher is in danger of losing his central environmental reference point for continuing studies into the functioning of various ecosystems.

The Nature Conservancy, Wildlife Preserves, The Natural Area Council and a number of other private organizations in this country are attempting to locate, acquire, and preserve outstanding natural areas for science, education, and the simple aesthetic enjoyment of wild nature. State and federal government agencies have also worked to set aside important natural habitats. For example, the Bureau of Land Management recently set up a system of over 100 natural areas on the Public Domain, protected for scientific and educational purposes. This work is being extended to other land-managing agencies; the Wilderness Act also helps insure that substantial areas in the country will remain essentially natural.

Despite these advances, there are a number of major gaps in the country's existing system of pre-

served natural areas. One of the major objectives of the International Biological Program's U.S. Subcommittee on Conservation of Ecosystems will be to see the

"establishment within the United States and its possessions of a comprehensive system of protected research reserves. This system will include examples of intensively managed ecosystems and of all important natural ecosystems."

In order to accomplish this objective and related goals, such as the ecological description of all reserved areas and studies to determine appropriate reserve management, the Subcommittee will support:

1. Activities leading to better definition of *criteria* for designation of ecosystem types. A number of existing classifications will probably be adapted to fit the specific needs of IBP.

2. *Inventory* of major ecosystems in the United States and adjoining areas. Procedures for collection, collation, and dissemination of information will be developed in cooperation with Canada and Mexico. Where important knowledge gaps exist, the Subcommittee will encourage necessary new surveys.

3. Establishment of *priorities* for action. Since the creation of additional reserves cannot be accomplished simultaneously, a system of priorities for action is badly needed. Criteria for setting priorities will include: habitats immediately threatened, uniqueness, typicalness, areas not now included in any reserve, and areas of special research significance due to easy accessibility or long histories of research.

4. Cooperation with public and private agencies, to designate *new reserve areas* and to complete the reserve system.

5. *Comprehensive* ecological surveys and research on preserved areas to provide data for better protection and management. Such work will range from investigations into important legal procedures in assuring protection to research on needed management techniques to preserve or restore a particular stage of succession.

6. *Training* and *education* of people in descriptive ecology. Biology's recent emphasis on laboratory study has resulted in a relative decline in training people for descriptive work. The IBP foresees a shortage of qualified scientists interested

in descriptive ecology of the kind necessary to carry out the program's objectives.

7. *International cooperation* to assist creation of a world-wide system of research reserves. Cooperative programs will stress common hemispheric projects but will also include capability to respond to specific requests from any other country for cooperation in IBP conservation programs.

There will doubtless be a close relationship between the quality of the future biosphere and the consequences of interdisciplinary research conducted on protected ecosystem reserves. As noted earlier, one of the major problems of our times is the rapidity with which technology and its impact on the human environment is accelerating. Man himself is being rapidly changed by his own works. Dr. Roger Revelle expressed his concern for this problem when he recently wrote:

"Our technology has outpaced our understanding, our cleverness has grown faster than our wisdom."

At this point it is important to emphasize the general failure of biological training to provide an educational basis for understanding the rational use of environmental resources. Biology must help prepare the average citizen to deal effectively with the multitude of environmental quality problems now facing him; this will mean much closer integration of basic environmental principles to be found in geography, economics, political science, psychology, sociology, regional planning, and law. Biology has a vital, indeed a primary, role to play in the development of environmental science. To date, however, we have tended to operate in a disciplinary vacuum — generally unwilling to relate our training and research to other disciplines concerned with environment; similarly, we have been unable to provide our students with a strong biological background for understanding their role and responsibilities in influencing the crucial inter-relationship between human society and the biosphere. Providing such a framework for better environmental understanding must be the biologist's basic educational task for the future.

Beyond improving our training and educational programs, how will we, as scientists, meet the coming environmental revolution? Will we have the wisdom to study before we manipulate, to improve productivity while avoiding irreversible

change? If not, the pressures of human numbers and misdirected technology will result in environmental degradation and deterioration. The challenge is clear; man will change the face of the earth more rapidly in years to come than he ever has before. It will be up to the biologist, ecologist, and natural scientist to expand our understanding of long-term environmental processes and effectively communicate these understandings to shape social and economic decision-making.

In communicating our insights on environmental process to other disciplines, biology has been notably unsuccessful to date. Indeed, all of the natural sciences have been notorious for their unwillingness to treat social issues caused by or related to their own bodies of knowledge. The socially-concerned scientist must deal with at least three levels of decision-makers that affect the environment; the land owner, administrator, and politician-legislator; the engineer who actually modifies the environment; and the public. Over the past few years there has been some progress in educating the general public to be more aware of the multiple facets of the human environmental crisis, but in the attempt to forestall immediate threats we have often responded inadequately, dealing only with symptoms and not the basic causes of deterioration.

Lacking any adequate political and administrative responsibility for the many facets of environmental change, it will be up to that segment of our society best-informed about such problems to inform the public and work for the creation of more effective institutions to anticipate and deal with environmental matters. The biologist has a particularly important role to play in this education and re-orientation of our society. Until public comprehension and concern for the scope of the problems afflicting the biosphere is improved, there is little hope for sufficient consensus to change existing institutional approaches to environmental control. Therefore a greatly expanded program of public education on the ecological effects of human technology and industrial growth is urgently needed. We can no longer afford to turn our backs on problems that will determine the future well-being of our species.

Another realm in which the biologist must play an increasingly active role is in the improvement

of communications at the legislative, political, and administrative decision levels. Once the ecologist's message is effectively understood and heeded by these decision-makers, the engineer and the "bulldozer mentality" will be presented with a new range of choices in how to more effectively channel their efforts into a more harmonious relationship with the biosphere. Biologist's efforts at general education should provide some basis of support for change, but we must utilize as many other methods as possible to encourage permanent alterations: discussions with friends, speeches, articles, radio and television talks, utilization of various audio-visual media, and support for various action organizations willing to assist in pressing for reform — most of these are channels open to all biologists.

But the permanent modification of our society's attitudes toward nature will require some deeper change in the political and administrative machinery of government; we need a means for institutional attention to the long-term, cumulative environmental results of complex systems of technological change. Traditionally, American government has had no such mechanism for development of overall environmental policy; instead we have substituted analysis and specific problem-solving and left resource synthesis and long-term goals to a "muddling through" process. Under such conditions, long-term environmental values are almost always sacrificed to immediate political, economic, and military advantages.

One of the central problems affecting the relationship between governmental policies and environment control has been the scattered, divided responsibility for environmental issues. Lacking any effective mechanism for coordination of diverse projects under equally diverse agency responsibilities, there has often been a deterioration of other values not considered — until their loss has underlined the importance of their conservation. Thus we often find ourselves in a situation where each agency tends to pursue its own unilateral course without regard to the broader environmental consequences of their programs. A multitude of special interest lobbies and inter-agency rivalries tend only to further fractionalize environmental policy-making.

There is considerable evidence that this period of environmental "laissez-faire" may be nearing an end. Over the past few years there have been several attempts to integrate the administrative means for improving environmental policy at the federal level. To mention only a few: the Ecological Research and Surveys Bill; the proposed Council on Environmental Quality directly under the President; the proposed Department of Natural Resources; and the recent creation of the Environmental Science Services Administration.

Some improvements have already been made in solving specific problems in environmental administration through legislation and a variety of inter-agency agreements and understandings that require joint planning and consultation. Control of water quality and pesticides are two good examples of complex resource issues that have been dealt with in this fashion. Nevertheless, the structure of federal government is still poorly adapted to handling the considerable array of important environmental policy decisions now facing it; this administrative failure is particularly true of those gradual and unobtrusive declines in environmental quality which individually have little dramatic impact, but when absorbed cumulatively over a long period of time threaten to change the whole structure of our society.

But how are we to create adequate administrative institutions for coordinating environmental understanding and control, Dr. Gilbert White, in 1958, concluded that the major obstacle to improvement of natural resource administration practices in our country was an absence of analysis that:

"would present estimates of the consequences of each of the politically practicable lines of public action. Thereby the political process of choice would be sharpened rather than curbed, and governmental intervention seen in perspective with the alternatives."

He saw such analysis as an important educational function, leading to better public perception of environmental issues. If fully effective, this could lead to public consensus and clearer possibilities for political and administrative action to create better institutions for environmental control.

Unless conservationists, biologists, and ecologists are able to build support for institutional evolution and innovation, much of our present

concern for preservation of environmental quality will be to no avail. The natural area preservation movement, as vital as it is, has little hope of eventual success unless the environment surrounding such areas is protected and cared for as well.

The central thesis of this paper is that in a culture and economy capable of creating great canals and harbors by atomic blast; able to double and even triple the life span of man; and clever enough to tap fossil fuel, solar, and nuclear energy sources for a variety of purposes — we are woefully behind in understanding the total ecological effects of these changes. Until we make the ecological point of view a central focal point in our education, administration, and environmental action, there is little room for long-term optimism. Ecology, particularly as applied to questions of man-induced environmental change, is still relatively underdeveloped; yet, until we as biologists and ecologists are willing to interpret our insights to citizens, engineers, politicians, administrators and other decision-makers, the impact of new technologies will continue to accelerate uncontrolled environmental change. Therein lies a major personal challenge that all of us face. As Dr. Pierre Dansereau recently summarized this undertaking:

"Our consciousness of environment, and of ourselves in it, is complex but not unfathomable. Our instruments of research and our means of expression are extremely powerful. We are more limited... by the failure of our imagination than by any obstacle outside ourselves. A valid imaginary reconstruction of our world is now our greatest task. It may even be the condition of our survival."

REFERENCES

- Cain, Stanley A. 1967. Can Ecology Provide the Basis for Synthesis Among the Social Sciences? Mimeographed Speech. U.S. Dept. of Interior, Washington, D.C.
- . 1967. The Ecological Approach to Management of the Range Resource as Needed by a Management Agency. Mimeographed speech. U.S. Dept. of Interior, Washington, D.C.
- Caldwell, Lynton K. ed. 1967. Environmental Studies. Nos. I, II, III, IV. Institute of Public Administration. Indiana University.
- Dansereau, Pierre. 1966. Ecological Impact and Human Ecology. In: The Future Environments of North America. Darling, F. Fraser and Milton, John P. Eds. Natural History Press. Garden City, New York.

- Darling, F. Fraser and Milton, John P. editors. 1966. The Future Environments of North America. Natural History Press. Garden City, New York.
- Milton, John P. 1964. Conversations on Ecology XI. — The Garden Journal 14:4. New York Botanical Garden. New York.
- National Academy of Sciences — National Research Council. January 1967. U.S. Participation in the International Biological Program. Report No. 2. Washington, D.C.
- . January 1967. Program Statement of the Subcommittee on Conservation of Ecosystems. Washington, D.C.
- Ordway, Samuel H., Jr., Bowman, Wallace D., and Milton, John. 1964. Research on Natural Resources: A Review and Commentary. — Nat. Res. J. 4.
- White, Gilbert F. 1958. Broader Bases for Choice: the Next Key Move. In: Perspectives on Conservation. Jarret, Henry. Ed. Johns Hopkins Press. Baltimore.

Paul Yokley, Jr., Receives 1969 ASB Research Award

Dr. Paul Yokley, Jr. of Florence State University was winner of the ASB Research Prize for 1969. The title of his research paper was "Life History of *Pleurobema cordatum* (Rafinesque, 1829)." A check for \$100 was presented to Dr. Yokley by the Carolina Biological Supply Company at the ASB annual banquet on Friday, April 18, at Memphis State University.

Dr. Yokley holds degrees from Florence State University, George Peabody College, and Ohio State University.

Seven manuscripts were entered for the Research Prize in 1969. The papers were judged by biologists at Southern Illinois University under the leadership of Drs. Jacob Verduin and W. C. Ashby.

William L. Mengebier Receives 1969 Meritorious Teaching Award

Dr. William L. Mengebier, professor of biology at Bridgewater College, has been honored by The ASB for "especially meritorius teaching," one of the highest awards of the Association of Southeastern Biologists.

The award was made at the 30th annual meeting of the Association in Memphis in the form of a certificate and cash honorarium.

Dr. Mengebier, who taught and was department chairman for 14 years at Madison College before going to Bridgewater last fall, was nominated for the teaching award by faculty colleagues and former students of Madison College and other members of the Association.

Only one other Virginian has received the award since its inception in 1952 — Dr. Ruskin S. Freer of Lynchburg College in 1964.

Dr. Mengebier has been teaching at southern institutions since 1946 when, on leaving the Army infantry, he joined the faculty at The Citadel, Charleston, S.C., where he had received his undergraduate degree in pre-medicine. He earned further degrees at Oberlin College in zoology and the University of Tennessee in physiology.

On the Madison campus Dr. Mengebier served on the curriculum committee and the graduate council, was chairman of the college research committee, and was chairman of the Southern Association of Colleges and Schools evaluation of the education program of the college, among other assignments.

For the past several summers, he has been working at the Virginia Institute of Marine Science in a study of a disease which kills oysters in the Chesapeake Bay. The research may lead to a breed of oyster resistant to the disease.

This winter he was a participant in the accrediting team of the Southern Association of Colleges and Schools visiting Tennessee Wesleyan College at Athens.

A Harrisonburg resident, Dr. Mengebier and his wife, the former Clelia Matthew of Charleston, S.C., have three daughters, one of which will graduate in June from the College of William and Mary.

The Meritorious Teaching Award is supplied by the Will Corporation of Georgia.

[ED. NOTE: The following letter from Dr. Mengebier was recently received in reference to the above award:]

There is very little that I can actually say that can express my feelings on being informed that I had won the Meritorious Teaching Award as presented by the A.S.B. It certainly is the high point of my twenty three years in college teach-

ing, and I consider it the highest honor that I could have achieved.

My thanks must, of course, go to my former students, wherever they may be, for their thoughtfulness in nominating me. They were, still are, and always shall be the challenge that makes teaching the great profession that it is. I only hope that my last ten years in the classroom will be half as rewarding as have been the past ones.

If possible, please try to find space in the bulletin for this note. I must say, that if the security of the nation was as efficient as that of the A.S.B., we'd never need to worry. I hadn't even suspected, else I certainly would have broken some other commitments to go to Memphis.

Sincerely,

William L. Mengebier
Professor of Biology
Bridgewater College

Because of administrative misunderstandings, the following abstract was omitted from the April, 1969, ASB Bulletin:

Comments on a New Genus and Species of Subterranean Fish from Alabama

JOHN E. COOPER AND ROBERT A. KUEHNE
*Institute of Speleology and Department of Zoology
University of Kentucky*

On March 18, 1967, a unique subterranean fish, representing a new genus and species ostensibly of the family Amblyopsidae, was discovered in a cave in northwestern Alabama. Subsequent trips yielded six additional specimens of this fish from the type cave, and its apparent absence from other caves in the area indicates that it is an endemic relic at this locality. Preliminary investigation suggests that this fish represents a phyletic line distinct from both the *Typhlichthys-Chologaster* and the *Amblyopsis* evolutionary lines. It is anticipated that more complete investigations, now being conducted by us and by T. L. Poulson at Yale University, will reveal information concerning the relationships of the amblyopsids with other fishes. The type locality supports a large population of *Myotis grisescens* and contains a great deal of guano, which appears to find its way into the cave water and which holds a rich and varied invertebrate fauna. The aquatic community in the type cave includes other troglotic elements, among them two species of crayfishes and an isopod.

Books and Periodicals

"WATER QUALITY CRITERIA," A Report of the National Technical Advisory Committee to the Secretary of the Interior. Published April 1, 1968, by The Federal Water Pollution Control Administration, U.S. Government Printing Office No. 0-178-250, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 234 pp. \$3.00.

The basic purposes of this book are: (1) to recommend water quality criteria for recreational and aesthetic uses; and (2) to identify research needs and priorities relating to water quality for recreational and aesthetic uses.

Actually, since it is difficult to consider any aspect of water quality or environmental quality in isolation, this book is a very comprehensive study of pollutional problems in general and water quality problems in particular. A distinguished committee representing a variety of viewpoints and disciplines, including not only academic but industrial and governmental representatives as well, participated in organizing the information for this volume. Considering the complexity of the problem, and the variety of viewpoints and disciplines, it is truly amazing that such a useful volume has emerged. Since environmental problems affect each of us directly, and since almost every discipline is now

involved in some way with environmental problems, this volume is an essential reference for college and departmental libraries, particularly those interested in ecology. In my opinion, much of the information is suitable for use in introductory courses in biology since most students want courses that are relevant to their lives—and environmental problems serve admirably to relate biology to the pressing social problems of today. In terms of information per dollar of cost, there are few books on the market today that can come close to this one.—JOHN CAIRNS, JR., *Department of Biology, Virginia Polytechnic Institute, Blacksburg, Virginia, 24061.*

Prentice-Hall

PLANT PROPAGATION PRINCIPLES AND PRACTICES, by H. T. Hartmann & D. E. Kester, July 5, 1968 (cloth) \$14.00

This fascinating book contains complete, up-to-the-minute information on all phases of plant propagation: its underlying principles and basic techniques.

Recognized throughout the world as the definitive work on the propagation of higher plants, the first edition has been revised and updated to include the

most significant developments and theories to emerge in recent years. The authors have devoted special chapters to newly prominent areas, such as tissue and organ culture, and emphasized the selection of proper materials for seed and vegetative propagation. The section on herbaceous ornamentals has been enlarged, and new chapters added to provide encyclopedic coverage of every aspect of plant growth.

RADIATION BIOLOGY, by Alison P. Casarett, August 30, 1968 (cloth) \$9.25

Radiation Biology is a broad, unified coverage of the effects of ionizing radiation in biological systems at the molecular, cellular, organ, organism, and community levels. Including introductory material on radiation physics, dosimetry, and general biology, the book gives special attention to mammalian radio-biology. Possibly the most outstanding feature of this fully illustrated book is its broad coverage without overemphasis on specific areas.

LABORATORY MANUAL FOR GENERAL MICROBIOLOGY, by C. Eklund & C. E. Lankford, September 7, 1967 (paper) \$4.95

INTRODUCTION TO BIOLOGICAL CHEMISTRY, by J. Awapara, June 24, 1968 (cloth) \$7.95

AUTORADIOGRAPHIC TECHNIQUES: LOCALIZATION OF RADIOISOTOPES IN BIOLOGICAL MATERIAL, by William D. Gude, 1968 (paper) \$3.95

THE CONTROL OF NUCLEAR ACTIVITY, L. Goldstein, Editor, June 2, 1967 (cloth) \$7.50

THE ORGANISM AS AN ADAPTIVE CONTROL SYSTEM, by John M. Reiner, January 3, 1968 (cloth) \$6.75

It is the aim of the author of this volume to present a unified picture, at the molecular level, of how cells and organisms work, based on the accomplishments of mathematical biophysics and molecular genetics in recent years.

BIOLOGY OF INVERTEBRATA, by James H. Wilmoth, August 29, 1967 (cloth) \$12.00

INTRODUCTION TO RESEARCH IN ULTRAVIOLET PHOTOBIOLOGY, by John Jagger, August 9, 1967 (paper) \$3.95

Pergamon Press

THE ULTRASTRUCTURE OF THE ANIMAL CELL, by L. T. Threadgold, January 15, 1968 (hardbound) \$13.00

O-LEVEL REVISION EXERCISES IN BIOLOGY, by J. D. Maunder & C. Johnston, August 21, 1967 (cloth) \$2.00

PROGRESS IN THE CHEMISTRY OF FATS AND OTHER LIPIDS, Vol. X, part 1, by Colin C. Lucas & Jessie H. Ridout, August 21, 1967 (cloth) \$7.75

LIFE SCIENCES RESEARCH AND LUNAR MEDICINE, Proceedings of the Second Lunar International Laboratory Symposium, December 18, 1967 (cloth) \$10.00

MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Wenner-Gren Center International Symposium Series, September 18, 1967 (cloth) \$21.50

CELLULAR ASPECTS OF MEMBRANE PERMEABILITY, by E. Schoffeniels, October 23, 1967 (cloth) \$15.00

TROPICAL PLANT TYPES, by B. G. M. Jamieson and J. F. Reynolds, 1967. (cloth) \$8.50

The MacMillan Company

THE SCIENCE OF GENETICS, by George W. Burns, February 10, 1969 (cloth) \$8.95

Dr. Burns' new text conveys both the scope and excitement of genetics. It discovers the entire field of genetics, with appropriate attention to classical, molecular, and social aspects.

A talented and experienced teacher, Dr. Burns introduces genetics by citing simple observations which are within the experience of all students. Through skillful questioning, he evokes insights into the causes of observed phenomena, progressing from simple to more complex ideas until answers are obtained at the deepest molecular levels of life.

BASIC BIOCHEMISTRY, (2nd Edition) by Max E. Rafelson, Jr., & Stephen B. Binkley, June 24, 1968 (paper) \$6.95, (cloth) \$9.95

The first edition of Basic Biochemistry (published in 1965) was widely praised as a clear, concise, systematic, and, above all, brief presentation of the fundamental principles of biochemistry. To achieve brevity, lengthy descriptions of organic reactions and biologic definitions were left to other, more exhaustive reference books. In this edition, as in the First Edition, the authors present the living organism as a chemical machine which utilizes the energy of foods to run chemical reactions so as to meet its own needs.

INVERTEBRATE ZOOLOGY, by Robert W. Hegner & Joseph G. Engemann, April 22, 1968 (Cloth) \$10.95

Thoroughly revised and updated, the second edition of this classic text presents the most important concepts

of invertebrate zoology and includes recent research progress and trends in the field. Retaining both the philosophy and approach of the First Edition, Invertebrate Zoology is organized for ease of learning and compatibility with the structure of lecture and laboratory courses.

A DIFFERENT KIND OF COUNTRY, by Raymand F. Dasmann, March 18, 1968 (cloth) \$5.95

This book is about diversity and what has been happening to it. It is written in the belief that the most important thing we can do is to maintain this diversity so that tomorrow there will still be a different kind of country, a different way of life.

BIOLOGY FOR THE MODERN MIND, by Hans Joachim Bogen, January 20, 1969 (cloth) \$6.95

Biology for the Modern Mind deals extensively with today's molecular biology, the scientific discipline aiming to use atomic and molecular science to clarify such aspects as inheritance, growth, differentiation, movement, and memory. Many convincing examples and graphic illustrations show how biological phenomena can be explained, giving the general reader an amazingly clear understanding of a complicated subject. The volume is divided into seven chapters: Life in the Cell; Modern Genetics; A Glance into the Cell: New Information from the Electron Microscope; Regulation Technique within the Cell; Molecular Memory; Immunity and Microbiology; The Primeval Broth and the Future of Man.

ANIMAL FUNCTION: PRINCIPLES AND ADAPTATIONS, by Malcolm S. Gordon, April 15, 1968 (cloth) \$12.95

Organized around physiological process, this book emphasizes adaptive functioning as it relates to survival of whole organisms in the natural world. Zoological, comparative, and evolutionary in approach and vertebrate in orientation, it illustrates the diversity of physiological mechanisms and adaptations evolved by animals.

Some topics which are not usually covered in physiology texts are included because they contribute to an understanding of how the variety of types of animals function and survive in the range of natural environments they inhabit. Specifically, these topics are: feeding mechanisms in animals; torpidity in endotherms; and information processing in nervous systems.

DNA: AT THE CORE OF LIFE ITSELF, by Lawrence Lessing, November 27, 1967 (cloth) \$3.95

DNA: At the Core of Life Itself, which won for Lawrence Lessing of Fortune magazine the Albert Lasker Medical Journalism Award, offers the non-specialist the most thorough explanation of the DNA molecule now available.

MOLECULAR GENETICS, by A. Gib DeBusk, May 20, 1968 (paper) \$1.95

Molecular Genetics distills the essence of biochemical genetics into a brief text suitable for the undergraduate student. Detailed descriptions of key experiments are included in order to convey to the reader the fact that the phenomenal progress in this field has been primarily due to ingenious experimental design by individual research geneticists. Extensive use is made of illustrations, especially to portray cellular mechanisms.

BIOLOGY OF THE LOWER VERTEBRATES, by Russell Hunter, March 11, 1968 (paper) \$2.95

A Biology of Lower Invertebrates presents a modern survey of "whole animal" physiology in the fifteen less complex phyla. Rather than dwelling on the details of classification and anatomy as in more conventional treatments, this text stresses functional morphology, characteristic adaptive behavior, and selected aspects of evolution, including functional homologies.

ECOLOGY OF POPULATIONS, by Arthur S. Boughey, May 20, 1968 (paper) \$2.50

Ecology of Populations leads from environmental requirements through population dynamics to community organization and evolution. It concludes with a chapter on human ecology.

A LABORATORY MANUAL OF MAMMALIAN ANATOMY & PHYSIOLOGY, by Sigmund Grollman, February 3, 1969 (paper) \$4.95

MICROBIOLOGY, by Kenneth L. Burdon & Robert P. Williams, June 3, 1968 (cloth) \$9.95

GRAPHIC BIOCHEMISTRY: CHEMISTRY OF BIOLOGICAL MOLECULES, by Thomas Peter Bennett, July 29, 1968. 2 Volumes (paper) \$3.95 each

THE HUMAN BODY: ITS STRUCTURE AND PHYSIOLOGY, by Sigmund Grollman, February 3, 1969 (cloth) \$9.95

EXPERIMENTAL CELL BIOLOGY, by William R. Bowen, February 10, 1969 (paper) \$4.95

EXPERIENCES IN LIFE SCIENCE (A LABORATORY GUIDE), by Eugene H. Kaplan, January 2, 1969 (paper) \$3.95

A LABORATORY SURVEY OF BIOLOGY, (2nd Edition), by William A. Cooper & Lawrence S. Dillon, January 2, 1969 (paper) \$5.95

PROBLEM SOLVING IN BIOLOGY, by Eugene H. Kaplan, March 25, 1969 (paper) \$4.95

BOTANY, A FUNCTIONAL APPROACH, by Walter H. Muller, February 17, 1969 (cloth) \$8.95



Aviaries (Residence of Supervisor in Background)

Duke University Field Station for Animal Behavior Studies

PETER H. KLOPFER
Director

Some years ago, a professor in the Zoology Department, needing a quiet, wooded area for some aviaries, was invited to use a portion of the Duke Forest. "Your activities are perfectly compatible with ours," the administration of the School of Forestry, guardians of the Forest, assured him. "We, too, seek to keep the Forest free of disturbance." A few weeks later, his birds in a state of frenzy from the growls of nearby chain saws, the unhappy zoologist complained to the Dean of the Forester's breach of faith. "Breach, indeed!," came the indignant response. "We created no disturbance. We were merely harvesting trees!"

Out of this confrontation came the realization that field facilities for the study of animal behavior have needs incompatible with many of the customary demands made of the University Forest. Thus, was born the Duke University Field Station for Animal Behavior Studies.

The conflicting demands of foresters, picnickers, sportsmen, and biologists can, sometimes, be reconciled. But the behaviorally oriented biologist or psychologist must be left out of such pacts. If (as is usually the case) his work demands extensive laboratory, in addition to field, facilities, or includes teaching responsibilities, his field station must be within a few minutes walk or ride from his labs and classes. At the same time, his field facilities must provide an adequate variety of natural habitats suitable to any animals he might require. They must, of course, be buffered from disturbances, and protected from vandals. And, despite the proximity of proper University laboratories, some provision for field labs and work-space is always a necessity.

Duke has met these needs by setting aside a wooded area some 85 acres in extent, 2 miles distant from the campus center. It is surrounded

by a belt of densely forested land in which activities are restricted so as to minimize interference with activities within the 85 acre core. The core itself is enclosed (and divided) by a 7 foot chain-link fence which serves to separate its licensed inhabitants from unwanted interlopers. The former include deer, raccoons, geese, and ducks of several species, to list but a few. Two small ponds provide sanctuary for some of these, various paddocks and pens allow for closer confinement of others, though still within their natural habitat. Adjoining this fenced area are a series of buildings that provide adjunct facilities. These include the exotic hexagons of the Primate Facility, a rustic log-cabin home for the Station Supervisor, barns and tool houses, and a ramshackle affair ("The Haven") that provides students of behavior sufficient in comfort to compensate for its esthetic lacks.

The actual population of the Station, the inhabitants of barns and cages, varies with the projects of any particular year's students. In 1968-69, a few of their studies included:

- an analysis of the mechanisms that underlie maternal behavior in goats;

- a study of social organization and signaling in fallow deer;
- comparisons of behavioral stereotype and niche size in tropical and temperate zone birds;
- longitudinal studies of the development of maternal care and communication in several species of lemurs;
- investigations of sensory capacities and perception in various beasts;
- studies of celestial navigation and orientation in birds.

Oversight of the Station is entrusted to a Director who answers to an interdepartmental Executive Committee which consists of representatives from the Zoology, Psychology, Anatomy, Anthropology, and Forestry Departments. A full-time Supervisor lives on the Station grounds and oversees the work of several part-time employees. Their salaries and much of the expense for routine maintenance is borne by the University itself, while the costs of feeding and vetting animals is charged to the research grants of the investigators using the Station. Many undergraduate and graduate students use the Station, too, of



One of Two Ponds for Water Fowl Studies

course, so the costs of its operations are legitimately considered both a "research" and an "educational" cost.

Much work in animal behavior requires only unlimited access to wilderness areas or refuges; other studies demand elaborately equipped labs and a few rooms for cages. Yet, it is becoming clear that the more significant questions in be-

havior cannot be answered in either the one domain or the other. Hence Duke is particularly fortunate in having both woods and labs in such close proximity. The publications of the behavior students at Duke provide impressive evidence of the advantages Duke's Field Station for Animal Behavior Studies confers.



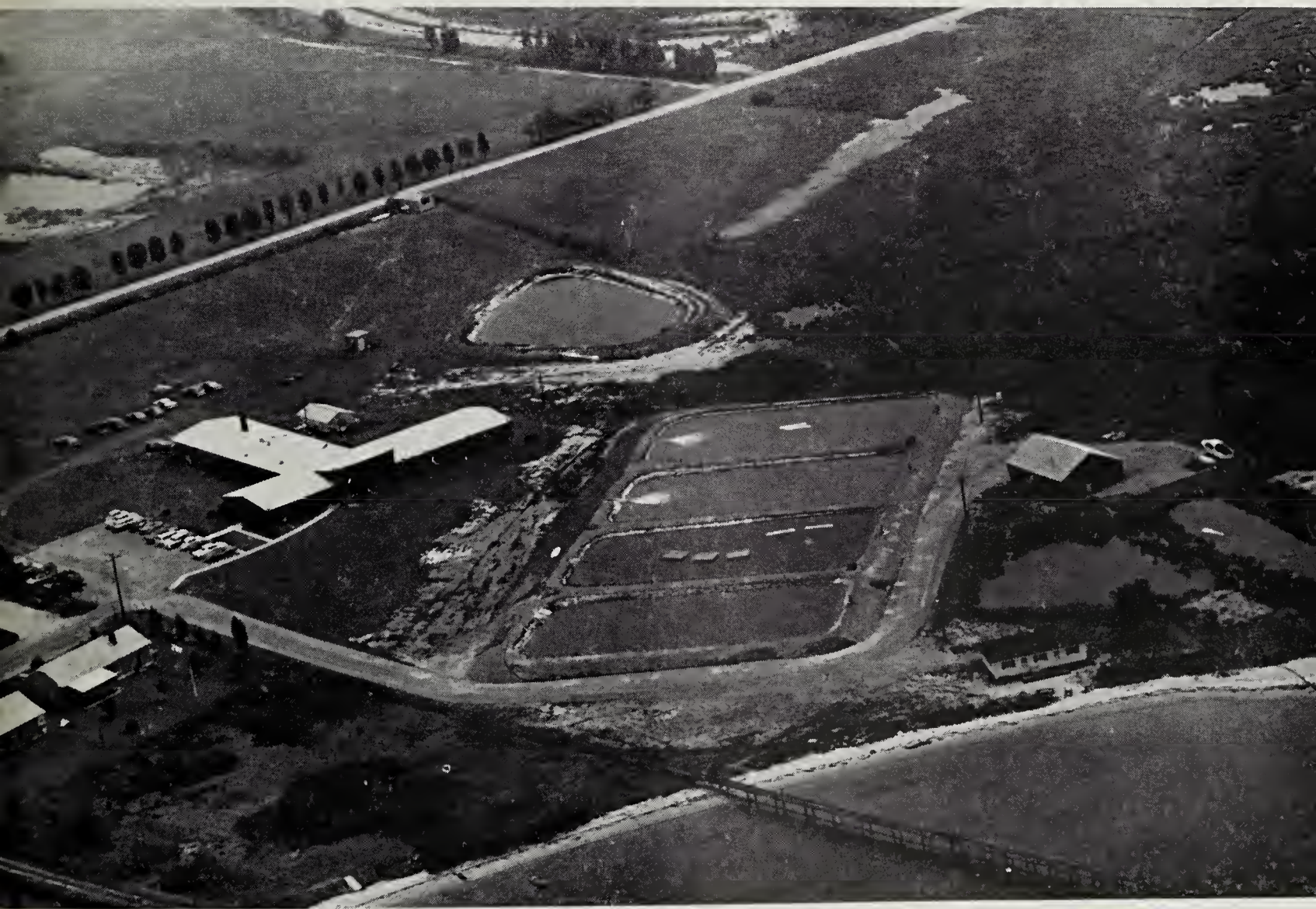
Goat Barn and Part of Herd

3 9.06
The ASB

BULLETIN

Volume 16, Number 4

October, 1969



Aerial view of the Bureau of Commercial Fisheries Biological Laboratory, Oxford, Maryland.

LIBRARY
OF THE
AMERICAN MUSEUM
OF NATURAL HISTORY

*The Official Quarterly Publication of
The Association of Southeastern Biologists*

The ASB BULLETIN is the official quarterly publication of the Association of Southeastern Biologists, Inc., and is published at Philadelphia, Penna., in January, April, July and October. Letters, news items, other contributions, and all communications about editorial matters should be addressed to C. W. Hart, Jr., Editor, The Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, Pa. 19103. Change of address should be sent promptly to the Secretary of the ASB, Dr. Dorothy Crandall Bliss, Randolph Macon Woman's College, Lynchburg, Virginia. Subscription orders from libraries and other institutions should be sent to the Business Manager, Dr. David J. Cotter, Georgia College, Milledgeville, Georgia 31061. Subscription rate for non-members of the ASB: \$4.00 per year. Printing and typography by the Fulton Press, Inc., Lancaster, Pa. Second-class postage paid at Philadelphia, Pennsylvania.

C. W. HART, JR.
EDITOR

DOROTHY CRANDALL BLISS
Associate Editor

JOSEPH F. FITZPATRICK, JR.,
News Editor

DAVID J. COTTER, Business Manager

OFFICERS OF THE ASB

- President — John M. Carpenter, University of Kentucky
Retiring President — Robert B. Short, Florida State University
President Elect — C. W. Hart, Jr., Academy of Natural Sciences of Philadelphia
Vice-President — James N. Dent, University of Virginia
Secretary — Dorothy Crandall Bliss, Randolph Macon Woman's College
Treasurer — David J. Cotter, Georgia College
Executive Committee —
Albert E. Radford, University of North Carolina
Burton J. Bogitsh, Vanderbilt University
Anna Josephine Bridgman, Agnes Scott College
Perry C. Holt, Virginia Polytechnic Institute
Charles Ray, Jr., Emory University
John H. Mullahy, Loyola University (Louisiana)
All officers are ex officio members of the executive committee.



CONTENTS

The Bureau of Commercial Fisheries Laboratory at Oxford, Maryland. — by A. S. Merrill and R. W. Hanks 103
Naming Fossil Fungi. — by Frederick A. Wolf 106
State College at Buffalo Offers Graduate Assistantships 108
Association Affairs 108
Books and Periodicals 110
A New Way to Teach Microbiology 112
News of Biology in the Southeast 113

Please note that the 1970 ASB annual meeting will be held at Florida Southern College in Lakeland, Florida, on the 2nd, 3rd, and 4th of April instead of the usual time approximately two weeks later. It is therefore very important that abstracts of papers to be presented at the meeting be sent to Dr. Margaret Gilbert, Chairman of the Program Committee, Dept. of Biology, Florida Southern College, Lakeland, Florida 33802, as far in advance of the January 10 deadline as possible.

Other deadlines associated with the annual meeting will be moved up as follows:

- December 15. — Suggestions for nominations for ASB officers and executive committee members. (See information in this issue.)
January 10. — Titles and abstracts of papers to be presented at the April meeting. (Call for papers to be mailed to membership in November.)
February 1. — Applications for Goethe Travel Awards to graduate students. (See information in this issue.)
February 1. — Papers to be considered for the Association Research Prize. (See information in this issue.)
March 1. — Applications for the Ivey F. Lewis Fellowship at Mountain Lake. (See information in this issue.)
January 15. — Nomination letters for the Meritorious Award for Teaching. (See information in this issue.)



The research vessel "Alosa," used by the Bureau of Commercial Fisheries Biological Laboratory at Oxford, Maryland, for shellfish research in the shallow water of Chesapeake Bay.

The Bureau of Commercial Fisheries Biological Laboratory at Oxford, Maryland, Meeting the Problems of the Shellfisheries

ARTHUR S. MERRILL & ROBERT W. HANKS *

Clams, oysters, and crabs are among the 10 most valuable fisheries in the United States. The Chesapeake Bay region produces more eastern oysters, more soft-shell clams, and more blue crabs than any other section of our country. It is logical that much of the biological research on these animals is centered in Chesapeake Bay, and that one of the few Federal shellfish laboratories should be located on the Bay shore.

Originally established at Annapolis in the 1940's, and recently (1960) moved to an excel-

lent, modern building at Oxford, Maryland, on the Bay's famed Eastern Shore, the Bureau of Commercial Fisheries Biological Laboratory is contributing vital research information to aid in maintaining and furthering the nation's shellfish industry.

Since the Oxford Laboratory was first occupied, a number of supporting facilities have been added. The physical plant includes 13,000 square feet of laboratory space for chemical, microbiological, histological, and immunological studies; and two rooms with running sea and estuarine water supplying a series of indoor and outdoor tanks. Office space, a conference room, and an excellent

* U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Oxford, Maryland 21654.

library of some 3,500 technical volumes plus many reprints and journals, are included in the main building. Other adjacent facilities comprise a shop-storage building, a small laboratory building for visiting investigators, an animal house, a greenhouse for culturing algae, and 4 one-quarter-acre earthen ponds for shellfish culture in a controlled environment.

The laboratory also maintains a substation on seaside Chincoteague Bay (Franklin City, Virginia), and another at Point Pleasant, New Jersey, providing access to a wide range of conditions, ranging from normal ocean salinity to brackish upper estuarine waters.

In addition to its research functions the laboratory houses the Federal Shellfish Advisory Service, which serves industry and the States by transmitting results of scientific research, and the mid-Atlantic area Office of Statistical Services, where fishery data are compiled and analyzed.

At present, the Oxford Laboratory has three major research programs: Shellfish Mortality, Surf Clam Biology, and Aquaculture. A brief description of each program will perhaps best delineate its objectives and achievements.

Shellfish Mortality Program:

The Shellfish Mortality Program occupies nearly half of the laboratory space and has the largest staff of research personnel. Oyster diseases have received the most attention because of massive mortalities in Delaware Bay and Lower Chesapeake Bay. Recently, however, disease research has been broadened to include crustaceans and fishes.

Phases of the Oxford Laboratory's disease research include histological, microbiological, parasitological, and immunological studies of mollusks and crustaceans. This program includes field activities to find disease-resistant oysters in both Chincoteague Bay, Virginia, and Chesapeake Bay in an effort to determine reasons for immunity or recovery of the resistant oyster. Other aspects of the field work are development of practical management methods to sustain oyster populations in enzootic areas, and to search for previously unknown oyster parasites.

Two haplosporidan species are causative agents in oyster mortalities. *Minchinia costalis* causes an enzootic disease in high-salinity bays, and *Minchinia nelsoni* is the infective agent in areas of lower salinity. It has so far been impossible to transmit either disease directly from oyster to oyster in the laboratory, whether by exposing healthy oysters in the same tanks with sick ones, or by any of several methods of inoculation of healthy oysters (with pathogenic organisms and diseased tissues). As a result, we suspect that *Minchinia* parasites have an intermediate host or vector, or that suitable environmental factors are required to stimulate infectivity. These possibilities are under examination.

We are exploring possible management methods that hinge upon the narrower environmental demands of the *Minchinia* organisms. Although *M. costalis* is tolerant to oceanic salinities and *M. nelsoni* thrives in less saline water, the oyster seems to succeed in water with salinities from 30‰ to 7‰. Therefore, judicious use of oyster culture techniques, and movement of raft-cultured oysters from area to area, may alleviate losses from disease-induced mortalities.

In aquatic and marine environments, perhaps even more than on land, ever-present bacteria may act as primary or secondary causes of disease. To gain an insight into the numbers and types of bacteria present in the environment of Chesapeake Bay oysters and crabs, regular samplings are made of the water, mud, and animal tissues. Parallel studies are being run on animals from Chincoteague Bay, which has markedly different bacterial flora. The significance of these differences is under study.

Little is known about the microbiology of the blood of normal and diseased crabs. A study is underway to determine the normal bacteria in crab blood at different seasons and stages of ecdysis, and variations from the normal which may be attributable to disease.

Recent declines in the catch of blue crabs throughout Chesapeake Bay and other sections of the south Atlantic have led several of our scientists to intensify the study of crab diseases. In the initial stages of this study we have described a hitherto unknown commensal, a new pathogenic

amoeba, and a new species of haplosporidan. Also new biochemical diagnostic procedures have been developed to screen disease organisms by analyses of crab blood. Thus, crab studies promise to be extremely fruitful in advancing fundamental knowledge of shellfish diseases in the aquatic environment.

Surf Clam Program:

This program is a major research area at the Oxford Laboratory. The study is directed toward a comprehensive biological understanding of the bivalve mollusk, *Spisula solidissima*. Although this species has been used since colonial days, it is only in the last 20 years that the surf clam has become important commercially — largely because of the development of a deep-water hydraulic dredge. Production in the last 5 years ranged from 38 to 45 millions of pounds of clam meats.

The difficulty in obtaining biological information, particularly for population studies among deep-water species, is well known. Considerable progress has been made, however, in several directions. As a result of research cruises, the distribution and abundance of the surf clam in the middle Atlantic bight have already been ascertained. Growth rates of young clams have been studied, and extrapolated to indicate that a typical commercial-sized (5 inches) clam may be 6 or 7 years old. Experiments with young, but sexually mature, clams indicate that spawning starts at definite temperature thresholds. Gonad maturation of surf clams from the population off New Jersey is stimulated by a gradual increase in bottom temperatures during the spring and early summer. A major annual spawning, usually in mid-July, may be followed by a second gonad development and spawning in October-November.

Direct experiments are underway, with tagged clams, to determine parameters of the populations. When these data have been assembled, it will be possible to predict the replacement potentials of this clam.

The Aquaculture Program:

This program is concerned with the ecology of the Tred Avon River, an estuary on which the

Oxford Laboratory is situated, and specifically with the development of oyster culture techniques. Members of this research group have made surveys of the hydrographic and biotic conditions of the river for several years. In this way, the influences of seasonal, climatic, and related factors upon the biota are evaluated in terms of effects on shellfish, and any significant deviations from the ecological "normal" are interpreted.

Part of the oyster culture research is development of culture techniques in natural and man-made salt-water ponds. Since 1964, culture and growth studies have been conducted in closed $\frac{1}{4}$ -acre ponds; it has been found that these ponds permit control of oyster predators and competitors. Future studies on the addition of algal food for maximum growth are planned.

Another aspect of oyster research involves off-bottom culture experiments. Raft techniques, similar to those employed in Japan and Korea, as

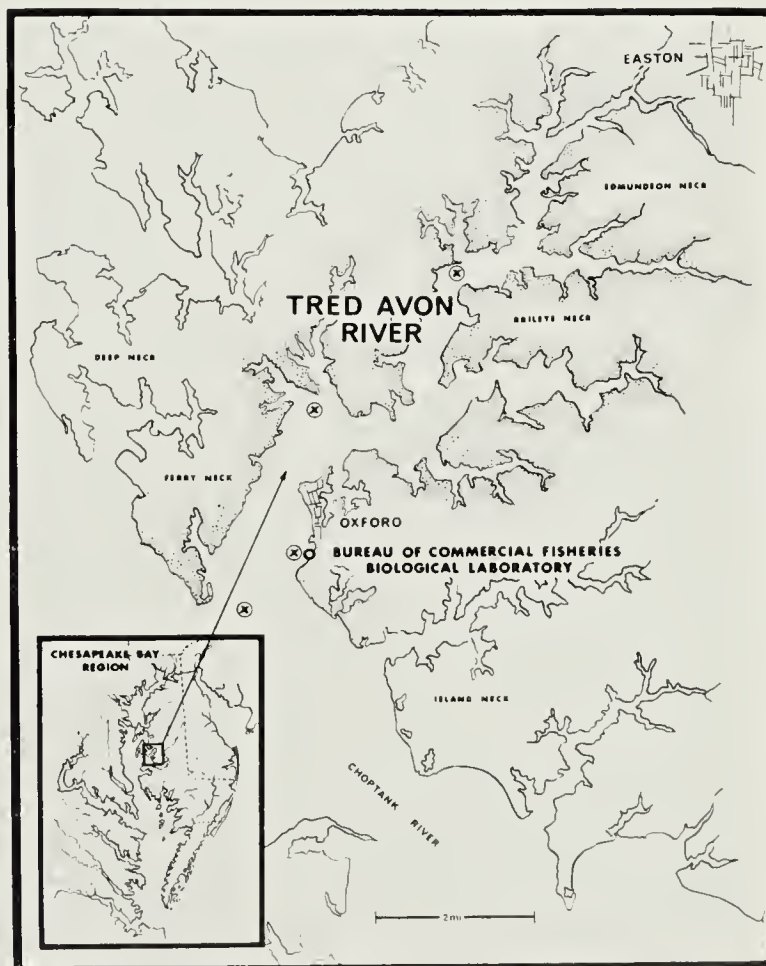


Chart of the Tred Avon River showing location of the Bureau of Commercial Fisheries Biological Laboratory, and general orientation of the area within the Chesapeake Bay Region (insert).

well as suspension of cultch shells from rigid, wharf-like structures, have been investigated. In both methods the oysters are suspended above the bottom where growth is faster, meat quality is higher, and survival is better than on the bottom. Off-bottom culture has proven to be particularly advantageous for growing oysters in areas where they would normally not grow because of soft bottom mud.

Present plans of this program include the establishment of experimental long-line culture (series of floats, with connecting submerged cables, to which are hung numbers of spat collectors); an investigation into the life history of the flatworm, *Stylochus ellipticus*, a major predator of young oysters in low-salinity water; studies of other oyster predators; and a more detailed ecological study of the closed ponds.

Plans are also underway to establish an oyster culture center in the Tred Avon River, opposite the Oxford Laboratory. Oysters will be grown off-bottom by four different methods — long-line, rigid structure, rafts, and trays. Interested people — watermen, industry, and researchers — will then have an opportunity to see the methods of off-bottom oyster culture that are practiced commercially in other countries.

The Oxford Laboratory, with a new physical plant and an active research staff, has therefore concentrated increased attention on our commercial shellfisheries. In all of our activities, as new problems and areas of investigation arise, fundamental research and practical help go hand-in-hand in a search for constant improvement of the shellfish industry.

Naming Fossil Fungi

FREDERICK A. WOLF
Duke University

The term fossil is widely accepted to connote the remains of animals or plants that have become calcified, silicified, or carbonized. Palaeontologists have provided evidence that, with ascent in time from the Devonian period and extending throughout all subsequent periods, fungi are present in a petrified state. They have been found to be especially abundant in the Pennsylvanian and Permian periods. Recent evidence, however, shows that fungi existed even during the Cambrian, and in all probability their existence began with the “dawn of life.” Seward (1933), one of the most knowledgeable investigators of fossil plants, expressed the opinion that fungi must be regarded as among the most ancient members of the plant kingdom. Additionally, fungi have been found to occur in amber — the fossilized resin of conifers — and such fossilized specimens are known from the Tertiary, Cretaceous, and Jurassic periods.

The significance of morphological resemblances of petrified plants to contemporary genera and the bearing of such similarities on evolutionary, and hence taxonomic, relationships were matters of deep concern to early palaeobotanists. For this reason, and without implying that the given fossil is identical with a present-day form, they added the suffix *-ites* to the stem of the generic name of the similar contemporary genus. Since the fossilized remains become lithified — i.e., turned to stone — the stony specimens were named lithites. This name was early contracted to the suffix *-ites*, which was then appended to the given generic name. In extenuation of this procedure, Seward (1898) states that “A common custom is to alter slightly the recent name by adding the termination *-opsis* or *-ites*.” By so doing it is implied that the given fossil is closely related morphologically to a given contemporary genus. Boureau (1964) states that

the employment of the suffix *-ites* dates from 1784 when it was used as the generic name *Calamites*, by Suckow. In explanation, Boureau (1869) pointed out that "Si Volkman avait désigné, en 1720, les fragments sous le nom de genre, latin, linéen de la Canne à sucre, il aurait commis une erreur grave, ce que n'est pas le cas avec Suckow qui appelle ces restes Calamites, et en les comparant avec *Equisetum giganteum*!"

Once this terminology had gained acceptance, several extensive classifications of fungi based upon resemblances with living genera appeared. These included the treatises by Meschinelli (1898, 1902) and Pia (1927). The former account deals with about 300 named species with *-ites* generic names, and the latter with *-ites* genera placed in 39 present-day families. But even with accord on generic names, vexatious questions on specific identities have remained unanswered. For example, are non-contemporaneous specimens specifically alike? Are specimens of the same geologic age but from different localities identical? Are specimens from different petrified hosts specifically distinct? Since fossil seed plants that are entirely unlike any contemporary flowering plants are known to occur, it becomes reasonable to believe that a similar situation could exist among fungi.

In scientific usage the term fossil is not restricted to stony or petrified remains of animals or plants, but includes the non-petrified or mummified remains of any organisms that have been preserved in the earth's crust. This concept has not gained wide acceptance among mycologists, to date, however, because of the supposed evanescent nature of fungi. Yet during recent years various investigators, including Dilcher (1965), Bradley (1967) and Wolf (1968) have demonstrated that the spores of many genera of fungi, if buried in sediments of ponds, lakes, marshes, swamps, streams, and other sites of alluvial deposits, have withstood the vicissitudes of time. The ages of deposits containing well-preserved spores are now known to range from late Pleistocene, throughout Eocene, and descending into Middle Devonian. Incredible as it may seem, many of these spores are morphologically like those of well-known contemporaneous fungal

genera. Such similarities have resulted in the application by some investigators of the same generic name to the fossil genus as is given to the similar present-day genus, a very reasonable procedure. Seward (1933) expressed disapproval, however, of such a procedure, as follows: "Such a double use of the same term should always be avoided as likely to lead to confusion and as tending to admit a divorce between botany and palaeobotany."

The fact remains that palaeontologists have not been consistent in the use of the suffix *-ites*. The attachment of *-ites* to the stem of a name does not necessarily imply taxonomic affinity or relationship. The Code of Botanical Nomenclature does not prescribe how fossil names should be formed other than that they must be Latinized.

Problems bearing on the naming of non-petrified fungi that have not changed morphologically during a period of millions of years, but must have evolved and changed physiologically to have been able to survive, await solution. The environmental factors that govern their preservation in sediments have been given little study and remain quite unknown. The ability of many species of fungi to adjust to their environment and thus to survive from the time that life on earth began must be regarded as a remarkably adaptable feature and as a provocative subject for speculation.

ACKNOWLEDGMENT

I am appreciative of advice on fossil taxonomy given me by Dr. James M. Schopf, Geological Survey, Ohio State University, and by Prof. Dr. Edward Boureau, University of Paris.

LITERATURE CITED

- Boureau, E. 1964. *Traité de Paleobotanique*. — Tome III: 540 p. (Vide p. 239). Masson et Cie, Paris.
- Boureau, E. 1969. Personal communication.
- Bradley, W. H. 1967. Two aquatic fungi (Chytridiales) of Eocene age from the Green River formation of Wyoming. — *American Journal of Botany*, 54:577-582.
- Dilcher, D. L. 1965. Epiphyllous fungi from Eocene deposits in Eastern Tennessee. *Paleontographica Abt. B* 116:2-54.
- Hirmer, N. (with the collaboration of Julius Pia and William Troll) 1927. — *Handbuch der Palaeobotanik* 1: 708 pp. München, R. Oldenbourg.

Meschinelli, A. 1892. Fungi Fossiles: In Saccardo's Sylloge Fungorum omnium hucusque cognitorum 10:741-805.

Meschinelli, A. 1902. Fungorum fossilum omnium hucusque cognitorum, Iconographia, 144 pp. Vicetea.

Seward, A. C. 1898. Fossil plants vol. 1: 452 pp. Cambridge University Press.

Seward, A. C. 1933. Plant life through the ages, a geological and botanical retrospect. 603 pp. Cambridge University Press.

Wolf, F. A. 1968. Fungus spores in Lake Singletary sediment. — Journal, Elisha Mitchell Scientific Society, 84: 277-232.

State University College at Buffalo Offers Graduate Assistantships

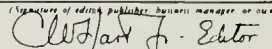
The Graduate School of the State University College at Buffalo, New York, is offering studies leading to the M.A. in Biology. Graduate assistantships (10 hr. maximum) with remission of tuition will be available in January. For information, write to Dr. William C. Scheffler, Chairman, Dept. of Biology, State University College at Buffalo, 1300 Elmwood Ave., Buffalo, N.Y. 14222.

Page 1

STATEMENT OF OWNERSHIP,
MANAGEMENT AND CIRCULATION
(Act of October 23, 1962, Section 4109, Title 49, United States Code)

Publisher: File two copies of this form with your postmaster.
Postmaster: Complete verification on page 2

Form Approved
Budget Bureau No. 48-8029

1. DATE OF FILING 2 October 1969	2. TITLE OF PUBLICATION The ASB Bulletin	
3. FREQUENCY OF ISSUE Quarterly (January, April, July, and October)		
4. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, city, county, state, ZIP code) Academy of Natural Sciences, 19th and The Parkway, Philadelphia, Pa. 19103		
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) Dept. of Biology, Georgia College, Milledgeville, Ga. 31061 (Dr. David Cotter, Treasurer)		
6. NAMES AND ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR PUBLISHER (Name and address) The Association of Southeastern Biologists, Inc., Chapel Hill, N.C. EDITOR (Name and address) C. W. Hart, Jr., Academy of Natural Sciences, 19th & The Parkway, Philadelphia, Pa. 19103 MANAGING EDITOR (Name and address) none		
7. OWNER (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.) NAME ADDRESS Association of Southeastern Biologists, Inc. Chapel Hill, N.C. (Dr. William J. Koch, Associate Professor, Dept. of Botany, Univ. of North Carolina, Agent.)		
8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES (If these are none, so state) NAME ADDRESS		
9. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES (Section 132.122, Postal Manual) (Check one) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes: ☒ Have not changed during preceding 12 months ☐ Have changed during preceding 12 months (If changed, publisher must submit explanation of change with this statement)		
10. EXTENT AND NATURE OF CIRCULATION	AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	ACTUAL NUMBER OF COPIES OF SINGLE ISSUE PUBLISHED NEAREST TO FILING DATE
A. TOTAL NO. COPIES PRINTED (Net Press Run)	1600	1600
B. PAID CIRCULATION 1. SALES THROUGH DEALERS AND CARRIERS, STREET VENDORS AND COUNTER SALES 2. MAIL SUBSCRIPTIONS	none 1200	none 1298
C. TOTAL PAID CIRCULATION	1200	1298
D. FREE DISTRIBUTION (including samples) BY MAIL, CARRIER OR OTHER MEANS	250	75
E. TOTAL DISTRIBUTION (Sum of C and D)	1450	1373
F. OFFICE USE, LEFT-OVER, UNACCOUNTED SPOILED AFTER PRINTING	150	227
G. TOTAL (Sum of E & F—should equal net press run shown in A)	1600	1600
I certify that the statements made by me above are correct and complete 		

POD Form 3526 May 1968

ASSOCIATION AFFAIRS

ASSOCIATION RESEARCH PRIZE

If you intend to present a paper at the annual meeting of the Association of Southeastern Biologists, we wish to call your attention to the Association Research Prize and invite you to submit your manuscript in competition. This prize of \$100. is sponsored by the Carolina Biological Supply Company, Burlington, North Carolina. Rules and regulations are as follows:

1. The Research Prize is to be awarded for an especially meritorious paper actually presented at the annual meeting.
2. Only members are eligible to submit papers in competition for the Research Prize. This applies to all names on the submitted paper.

3. Papers submitted in competition may be in press but must not have been published prior to March 1 of the year of the current competition.
4. Papers submitted in competition are judged by eminent scientists in the various fields of biology. These individuals are selected by the Research Committee and are from schools outside the Southeast. Every effort is made by the Research Committee to keep the authors of submitted papers anonymous. Criteria for the award are left to the discretion of the judges' panel, who may withhold said award if no paper is considered to have sufficient merit.
5. Papers must be submitted in triplicate and in their entirety not later than February 1, 1970, to Dr. Thomas L. Quay, Dept. of Zoology, North Carolina State Univ., Raleigh, North Carolina

27607. One copy of the prize-winning paper will remain in the ASB files, but all other copies will be returned to the authors as soon as possible.

6. Announcement of the winner of the Research Prize will be made at the annual meeting.

SUGGESTED NOMINEES FOR ASB OFFICES AND EXECUTIVE COMMITTEE POSITIONS

To the members of the Nominating Committee:
I wish to suggest that you consider the following ASB members in selecting nominees for offices and executive committee positions:

- PRESIDENT-ELECT
- VICE-PRESIDENT
- EXECUTIVE COMMITTEE MEMBERS (2 for 3-year terms)

Deadline: December 15

Mail to: DR. W. D. BURBANCK
Dept. of Biology
Emory University
Atlanta, Georgia 30333

MERITORIOUS AWARD NOMINATIONS

As in previous years an honorarium of \$100 has been made available by the Will Corporation of Georgia, to be used as an award for the recognition of especially meritorious teaching by a member of the ASB. The regulations governing the award are as follows:

The recipient must be a member of the ASB in good standing. He should have taught biology in a southern institution for at least ten years, and must be currently teaching. He must not be a dean or have regular administrative duties beyond the department level (this particular criterion requiring interpretation in individual cases). Among evidences of his qualifications is the progress of the candidate as indicated by recognition in his own institution (important assignments and other contributions specifically related to good teaching); and the number and quality of students for whom he provided primarily the inspiration to continue in biology, especially those who later received advanced degrees.

Past recipients of the Meritorious Award for Teaching are as follows:

- 1952. Dr. Mary Stuart MacDougall (Agnes Scott)
- 1953. Dr. Orland E. White (Univ. of Virginia)
- 1954. Dr. Woolford B. Baker (Emory)
- 1955. Dr. John N. Couch (Univ. of North Carolina)
- 1956. Dr. Hugo L. Blomquist (Duke)
- 1957. Dr. Ezda Deviney (Florida State)
- 1958. Dr. Henry R. Totten (Univ. of North Carolina)
- 1959. Dr. Margaret Hess (Winthrop College)

- 1960. Dr. Ora C. Bradbury (Wake Forest College)
- 1961. Dr. Warren Deacon (Vanderbilt)
- 1962. Dr. Septima C. Smith (Univ. of Alabama)
- 1963. Father Patrick H. Yancey (Spring Hill College)
- 1964. Dr. Ruskin S. Freer (Lynchburg College)
- 1965. Dr. Harwell P. Sturdivant (Western Maryland College)
- 1966. Dr. Charles Ray, Jr. (Emory Univ.)
- 1967. Dr. H. J. Oosting (Duke University)
- 1968. Dr. Wade T. Batson (Univ. of South Carolina)
- 1969. Dr. William L. Mengebier (Bridgewater College)

In these times in which so much is heard about teaching, it is particularly important that excellence in teaching should be rewarded and publicized in every way possible. Members of the ASB are urged to make nominations and send the needed supporting material to *Dr. Wade T. Batson, Dept. of Biology, Univ. of South Carolina, Columbia, South Carolina 29208, by January 15, 1970.*

COMMITTEE
WILLIAM L. MENGEBIER
JACK H. FEHON
WADE T. BATSON, *Chairman*

IVEY F. LEWIS FELLOWSHIP AT MOUNTAIN LAKE BIOLOGICAL STATION

A Research Fellowship of \$150.00 for summer course study or research at Mountain Lake Biological Station of the University of Virginia has been continued through the generosity of the Phipps and Bird Company of Richmond, Virginia. This fellowship, formerly known as the *Phipps and Bird Research Fellowship*, was re-named at the request of the Phipps and Bird Company. Any member of the Association may submit an application. The application should be accompanied by a summary of the planned work, by a list of important publications, and especially in the case of younger workers, by references and educational data. Applications should be sent to *Dr. J. J. Murray, Dept. of Biology, Univ. of Virginia, Charlottesville, Virginia 22903* not later than 1 March 1970. The selection will be made by the Research and Awards Committee of the ASB in consultation with the Director of the Mountain Lake Biological Station. The announcement of the recipient will be made at the annual meeting of the ASB.

COMMITTEE
J. J. MURRAY, *ex officio*
JAMES RIOPEL, *ex officio*
THOMAS L. QUAY, *Chairman*
ARTHUR W. JONES
PAUL YOKLEY, JR.

MARY GLIDE GOETHE TRAVEL AWARDS

For the thirteenth year there will be funds available through the generosity of the late Mr. C. M. Goethe for assistance to graduate students for expenses in connection with the annual ASB meetings, to be held this year at the Florida Southern College, Lakeland, Florida. Approximately \$300 will be available from the contributions of Mr. Goethe, and it is anticipated that most of the awards will be for maintenance (lodging and meals), and departments are urged to provide travel allowances for their graduate students or to invite them to travel in cars with staff members. Some travel allowances may be awarded by the committee to those living most distant from Lakeland.

Staff members are requested to call to the attention of qualified students in their respective institutions the availability of these awards. If there is more than one applicant from a department, the Goethe Committee may request the department to aid the committee's selection by ranking the applicants.

Any graduate student needing financial assistance in order to attend the 1970 meeting of the Association of Southeastern Biologists is eligible. Rules for making application for the Goethe Awards are as follows:

1. Indicate if application is being made for maintenance or travel or both. Give details, such as total sum requested, how

many nights and days are involved, if travel allowance is requested, the number of miles involved and the proposed method of transportation, and any other pertinent information.

2. Give information as to whether or not a paper is being presented by the applicant.
3. In a paragraph, give a brief history of your education to date, of how many years you have been — and plan to be — in graduate school, of your major field or fields of interest, of any publications which have appeared or which may be in preparation, and any other pertinent professional details. Give information on marital status and number of children.
4. Give your source or sources of support while in graduate school such as G.I. Bill, N.S.F., N.I.H., teaching assistantship, etc.
5. Have your major professor or departmental head write a letter supporting your application.
6. Applications and supporting letters, both in triplicate, should be in the hands of *Dr. William E. Brillhart, Dept. of Biology, Emory University, Atlanta, Georgia 30333*, by 1 February 1970. Applicants will be notified of the decision of the Committee as soon as possible.

FRANK R. BARCLAY

STEPHEN M. GITTLESON

WILLIAM E. BRILLHART, *Chairman*

Books and Periodicals

For every significant group of plants and animals in the sea, there should be a useful guide to their identification with illustrations, descriptions, habitat notes and other information, guides designed for the use of high ability high school students, undergraduates, the intelligent and curious layman, and professional scientists interested in organisms outside their field of specialization. Most of these guides must be more or less local in scope in order to avoid a complexity that defeats their purpose.

More marine biologists who are taxonomically oriented should write something of this nature, if for no other reason than to help develop the interest of young students in the biological sciences.

Two new books of this nature have recently appeared, both of which may be of interest to many members of ASB and their students.

Tropical Fishes

CARIBBEAN REEF FISHES, John E. Randall. T. F. H. Publications, Inc., 245 Cornelson Avenue, Jersey City, N.J., 07302, 1968, 318 p., 324 photographs (140 in color), \$6.50.

Probably no other professional ichthyologist has used SCUBA equipment as extensively in his research as has Dr. John E. Randall, author of this valuable guide to the reef fishes of south Florida, the West Indies and Caribbean Sea.

Dr. Randall is one of the most skillful and experienced of amateur divers, having spent countless hours under water in all the tropical seas of the world. As

a result, he has felt the need of amateur divers for a guide to the reef fishes, and he has produced a book that meets such a need in the most creditable manner.

The author is ichthyologist at the Bernice P. Bishop Museum in Honolulu, and marine biologist at the Hawaii Institute of Marine Biology. He was formerly Director of the Institute of Marine Biology of the University of Puerto Rico, and was associated with Miami's Institute of Marine Science. It was during these years that he carried on the field work throughout the Caribbean area that led to the writing of this book.

Every one of the 300 species of fishes in his book is illustrated by a superb photograph made by the author, 140 of them in high fidelity color. Since he collects the fish himself, he has been able to make color photographs of fishes never before recorded in this way. Fishes of tropical waters must be photographed immediately after capture and preferably before they die in order to capture on film their unbelievable hues. In preservation the colors fade or change, sometimes in a matter of minutes.

Second in value to these remarkable photographs is Dr. Randall's description of each species and his habitat notes. He does not have to rely upon previous Literature for this information; he knows from experience much more than can be found in print about these colorful marine animals.

Dr. Randall's book deserves better typography, a better binding, and paper that is not coated — pages that will not stick together if they should get wet. But both he and the publisher were anxious to keep down the price of the book so that students could obtain it. This is the kind of book that should be available in a deluxe edition and in paperback or well.

Any young person who snorkels or dives among the Florida Keys or the islands of the West Indies will treasure this scientifically accurate field guide; for that matter, so will any professional marine biologist who works in the Caribbean area.

New England Algae

SEAWEEDES OF CAPE COD AND THE ISLANDS, John M. Kingsbury. The Chatham Press, Inc., Chatham, Mass., 02633, 1969, 212 p., 100 full-page line drawings, \$12.50.

A phycologist and two artists have teamed up to produce a book of unusual beauty provided by its 100 line drawings and its good typography on high quality paper. This is a book that will be a useful field guide to anyone interested in the marine algae of New England because of author John M. Kingsbury's essays on each of the 100 or more species treated.

Through a combination of a generalized key, illustrations, a discussion, glossary, and a hand lens (to be supplied by the reader), users of the book will be able to make tentative identifications of most of the common

marine algae of New England (or even from New Jersey to Nova Scotia), and reasonably reliable determinations of some of the less difficult species.

The illustrations provided by Marcia and Edward Norman, line drawings with a charcoal-like texture, are works of art. Their artistic quality and uniformity have been accomplished with some sacrifice of reference value for identification. It is difficult, however, to incorporate into life-size (or smaller) habit sketches of marine algae those characters that distinguish them as species. In some cases, an enlarged portion of the plant has been added, and these will be of great help.

Dr. Kingsbury is Cornell's well-known authority on marine algae of the northeastern coast. He conducts a summer field course in marine science at Isle of Shoals in Maine. He is also well-known for his books on poisonous plants of the United States and Canada. His current research interest is the ecology of "Irish moss", *Chondrus crispus* (L.) Stackhouse, the red alga that has been harvested heavily for more than 25 years for its valuable cell wall polysaccharides. — Harold J. Humm, Marine Science Institute, University of South Florida, St. Petersburg 33701.

FIRST NATIONAL INVENTORY OF MARINE RESEARCH COMPLETED

The first definitive report on marine research activities sponsored by the United States was released today by Dr. Edward Wenk, Jr., Executive Secretary of the National Council on Marine Resources and Engineering Development.

Marine Research — Fiscal Year 1968 contains descriptive summaries of 2589 unclassified marine research projects supported during fiscal year 1968 by Federal and non-federal organizations. Identified with these projects, both in the text and in supplemental indexes, are 3022 associated investigators, 457 performing organizations, 25 Federal supporting agencies, and 95 non-federal sources of support. The inventory was undertaken to assess the scope, balance and texture of the national effort to understand the world's oceans, and to assist and encourage the exchange of research information within the marine sciences community.

In a Foreword to the catalog, Vice President Spiro T. Agnew, Chairman of the Marine Sciences Council, stated that:

"The establishment of a long-range program to utilize the oceans for the benefit of all mankind was set forth as a national policy by the Marine Resources and Engineering Development Act of 1966. Meeting marine science needs and opportunities in turn depends significantly upon a strong research capability. Such research encompasses a broad spectrum of disciplines in support of, among others, the development of living and non-living resources, environmental prediction, conservation

and recreation, maritime commerce, and national security activities. While these endeavors are supported largely by the Federal Government, they are conducted in some 95 academic institutions; several hundred State and local organizations and laboratories; over 35 private foundations and professional associations; hundreds of industrial organizations; as well as in more than 85 Federal laboratories.

"Maximizing benefits from the Nation's growing investment in the oceans requires developing the full potential of this widely dispersed research capability. Because of the very number and diversity of organizations and activities involved, however, there is a serious hazard of unwitting duplication or gaps in research efforts. Complete information about on-going research and effective information transfer thus become key elements for assuring that individual scientists, engineers, administrators, and policy officials have access to knowledge of 'who is doing what, where, and with whose support.'

"Toward that end, the National Council on Marine Resources and Engineering Development is releasing this report: *Marine Research — Fiscal Year 1968* . . . It is hoped that among the benefits from this publication will be expanded recognition of the value of descriptive information about marine programs, and support for activities designed to improve the flow of information among specialists working in this area."

The catalog was prepared under contract by the Science Information Exchange of the Smithsonian Institution which had been assigned by the Council in April 1968 the continuing mission of serving as a national center to collect and disseminate information about current, unclassified marine research.

Marine Research — Fiscal Year 1968 is available for \$5.50 from the U.S. Government Printing Office as document number 1969-350-238.

A New Way to Teach Microbiology

In too many beginning courses, though, the student learns about microbes by reading and listening to lectures. No doubt this is because experiments in microbiology are thought to require tools and techniques that are too costly or time-consuming for the high school laboratory.

Not so, says Millipore Corporation — at least, not any more. The Bedford, Mass., manufacturer of membrane filtration systems and scientific instruments has introduced a self-contained kit that enables any high school student, with little supervision, to isolate, grow and observe a variety of microorganisms. The illustrated manual furnishes a lively introduction to microbiology and detailed experiments involving many

common microbes — bacteria, yeasts, mold — found in food, soil, the air, on the skin and in polluted rivers and streams.

For schools equipped with autoclaves, vacuum lines, Bunsen burners and binocular microscopes, the firm also offers an assortment of filtration systems and related apparatus ranging from the very simple to the very sophisticated. These are the same Millipore systems used by microbiological researchers, cytologists, clinical technologists, public health officials and a variety of others involved in clinical, biological and pollution analysis.

Millipore filters are thin plastic membranes with billions of microscopic pores per square inch. They work by trapping any particle or microbe larger than pore size on the filter surface. (They're available in pore diameters small enough to trap a polio virus). This makes it easy to isolate a few microbes from a large volume of fluid. The filter also furnishes a biologically inert white surface on which the microbes can be cultured to form visible colonies.

Microbes are cultured simply by placing the filter on an absorbent pad saturated with nutrient medium. The colonies are nourished by capillary action through the filter pores. As a result, microbes usually grow faster on a Millipore filter than they do when immersed in liquid medium. This is one reason for their value in clinical laboratories for identifying bacteria from blood and urine, where early diagnosis is so important.

The kit uses an inexpensive plastic filtration system, disposable filters, break-open ampoules of culture medium and presterilized Petri dishes, eliminating the time-consuming preparation of agar plates and doing away with most of the messy housekeeping chores associated with other bacteriological culturing procedures.

In addition to their use as a research and analytical tool, membrane filters are used in the pharmaceutical, aerospace, electronic, chemical processing, food and beverage industries to micro-filter all sorts of critical gases and liquids. Drinking water used by the Apollo astronauts is sterilized through Millipore membrane filters, as are many vaccines, insulin, antibiotics and intravenous solutions.

These unusual filters are also doing yeoman work in industrial bacteriology, industrial air sampling, and in the processing of beverages, hydraulic fluids, artificial sweeteners, photochemicals, reactor coolants, cosmetics and dozens of other fluids requiring extreme cleanliness, purity or freedom from microscopic contaminants.

News of Biology in the Southeast

STATE CORRESPONDENTS

Alabama — Jack S. Brown, Florence State University; James Wilkes, Troy State University

Florida — Position Vacant

Georgia — Fred K. Parrish, Georgia State College

Kentucky — Gary E. Dillard, Western Kentucky University

Louisiana — Harry J. Bennett, Louisiana State University

Mississippi — Position Vacant

North Carolina — C. J. Umphlett, University of North Carolina

South Carolina — J. M. Herr, Univ. of South Carolina; G. Thomas Riggan, Jr., Newberry College

Tennessee — Donald Caplenor, Tennessee Technical University

Virginia — Jean Pugh, Christopher Newport College

West Virginia — Earl L. Core, West Virginia University

Joseph F. Fitzpatrick, Jr. — Editor
Dept. of Biology

Randolph Macon Woman's College
Lynchburg, Virginia 24504

About People

John D. Freeman was appointed Assistant Professor, Department of Botany and Plant Pathology, Auburn University (Alabama), in September, 1968. He received the B.A. degree from Austin Peay College and the Ph.D. degree from Vanderbilt University. His research is in plant taxonomy.

Elizabeth Lee Klepper was appointed Assistant Professor, Department of Botany and Plant Pathology, Auburn University (Alabama), in July, 1968. She received the B.A. from Vanderbilt University and the M.A. and Ph.D. degrees from Duke University. She also attended Exeter University in England on a Marshall Scholarship and conducts her research in mineral nutrition and water relations of plants.

Fernando J. Subirats was appointed Instructor, Department of Botany and Plant Pathology, Auburn University (Alabama), in July 1968. He received the B.S. degree from Havana University and the M.S. degree from Auburn University. He conducts research on fundamental and applied aspects of field crop pathology.

U. L. Diener and N. D. Davis, both Professors, Department of Botany and Plant Pathology, Auburn University (Alabama), have been awarded a grant of \$11,000 by the USPHS to conduct a research program entitled "Growth and Toxin Production of Food-Storage Fungi."

D. E. Davis, Alumni Professor, and B. Truelove, Associate Professor Department of Botany and Plant Pathology, Auburn University (Alabama), have been awarded \$17,000 by USPHS to study "Fate and Mechanism of Action of Herbicides."

E. A. Curl, Professor, and R. Rodriguez-Kabana, Assistant Professor, Department of Botany and Plant Pathology, Auburn University (Alabama), have been awarded a three year grant of \$66,000 in support of a research program entitled, "Interactions of Herbicides and Soil-Borne Cotton Disease Fungi."

J. D. Freeman, W. E. Goslin, and E. L. Klepper, Department of Botany and Plant Pathology, Auburn University (Alabama), have each been awarded University grants to study plant taxonomy, aquatic plant ecology and plant physiology, respectively. Likewise, D. E. Dacis and J. A. Lyle received five commercial grants for research in herbicide physiology and fungicidal diseases, respectively.

David G. Davis has been appointed Associate Professor of Biology at the University of Alabama, Tuscaloosa. He comes following a tenure as a USPHS Special Research Fellow in the Laboratory of Genetics, University of Wisconsin.

Herbert S. Schwartz, Department of Biology, University of Alabama, Tuscaloosa, has been awarded a three year grant of \$81,650 by USPHS to support research investigating the reactions of mitomycin C and porfiro-mycin in proliferating and non-proliferating cells of rats and mice.

A two year grant of \$29,000 has been awarded Joseph C. O'Kelley, Department of Biology, University of Alabama, Tuscaloosa, by NSF. The photobiology of cytoplasmic cleavage in *Protosiphon botryoides* is the research supported.

Jan Eagles has joined the staff of the Department of Biology, Alabama College, Montevallo. She recently was awarded the Ph.D. in the Department of Anatomy, University of Alabama Medical School, Birmingham.

J. F. Fitzpatrick, Jr., News Editor for the *Bulletin*, has been appointed Associate Professor of Biology, Randolph-Macon Woman's College, Lynchburg, Virginia. He is leaving a position at Mississippi State University, State College.

An expansion of the Botany Department at the University of Kentucky, Lexington, has resulted in the appointment of four new people to the Botany staff during the past year: Jerry M. Baskin (Ph.D., Vanderbilt, plant ecologist) came following a year of postdoctoral study at the University of Florida, Gainesville; James H. Eley (Ph.D., Texas, plant biochemist) came following an NIH postdoctoral fellowship at Brandeis; Thomas J. Leonard (Ph.D., Indiana, fungal genetics and physiology) came following an NIH postdoctoral fellowship at Harvard; Willem Meijer (Ph.D., Amsterdam, the Netherlands, plant taxonomist-ecologist) joined the faculty following nine years of study on the taxonomy and ecology of the plants of Sabah (Borneo).

Langley Wood, Head of the Department of Environmental Physiology at the Virginia Institute of Marine Science, Gloucester Point, has been appointed Professor of Zoology and Chairman of the Department of Zoology at the University of New Hampshire, Durham. He will assume his duties there on July 1, 1969.

Sohan P. Modak, Cell Growth and Differentiation Group, Oak Ridge National Laboratories, Oak Ridge, Tennessee, left the Group after a three year tenure on 14 February. After a three month sojourn at the University of Kentucky, Lexington, he returned to his home in India.

R. B. Williams, USDI, FWS, BCF Radiobiological Laboratories, Beaufort, North Carolina, has been appointed Associate Editor for the *Proceedings of the National Shellfisheries Association* and also was elected a Fellow of the American Association for the Advancement of Science.

J. W. Angelovic, USDI, FWS, BCF Radiobiological Laboratories, Beaufort, North Carolina, was appointed to the Radioecology Committee of the Ecological Society of America.

Rudolf K. Achazi has joined the Cell Growth and Differentiation Group, ORNL, as a Deutsche Forschungsgemeinschaft Postdoctoral Fellow. He received the Ph.D. from the University of Heidelberg, West Germany.

Fumitoshi Chino has joined the staff of the Radiation Immunology Group, ORNL. He received the M.D. degree in 1959 and the Ph.D. in 1964 from the Shinshi University School of Medicine, Matsumoto City, Japan.

R. A. Brown has left the Radiation Immunology Group, ORNL, to accept a position at the Puerto Rico Nuclear Center, University of Puerto Rico, USAEC, San Juan.

W. L. Russell, ORNL, attended a Ciba Foundation Symposium on "Mutation as a Cell Process" in London, England, presented a paper, and conferred with colleagues in Munich, Germany, and Rome, Italy, before returning home.

Charles B. Metz, Professor of Zoology, University of Miami [Florida] Institute of Molecular Evolution, will direct the Woods Hole summer research program in reproduction physiology for the eighth consecutive year in 1969. The program, which Dr. Metz helped found, has been supported since its inception by the National Institute of Child Health and Human Development, HEW, and it has been supported again by a five year grant of \$478,275 from the same agency.

Robert D. Faulkner, after receiving a Career Development Award from NIH, took leave of absence from the University of Nebraska to join the Nucleic Acid Chemistry Group, ORNL.

Kurt M. Hilse left the Mammalian Genetics Group, ORNL, on 28 February to return to his position at the Max-Planck-Institut für Biochemie, Munich, Germany.

Alexander Hollaender, ORNL, has been elected a "membro Correspondente de la Academia Brasileira de Ciencias" (Corresponding member of the Brazilian Academy of Sciences).

Toshihiko Sado left the Radiation Immunology Group, ORNL, to accept a position with the National Institute of Radiological Sciences, Chiba, Japan.

Kenneth E. Muse has been appointed Research Associate and Supervisor of the Electron Microscope Center, North Carolina State University, Raleigh.

Amir Muhammed who received his Ph.D. from Oxford University, England, has joined the Molecular Photobiology of DNA Group of ORNL.

Irene Boliek has been awarded the endowed Vivian Gay and J. L. Coker, Jr., Professorship for distinguished

teaching at Coker College, Hartsville, South Carolina. Dr. Boliek has been Professor and Head, Department of Biology since 1965.

Richard D. Brock has joined the Mammalian Cytogenetics Group, Oak Ridge National Laboratories, Oak Ridge, Tennessee, as a Consultant. Dr. Brock received his degree in genetics from the University of London, England, and is a member of the Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia.

John B. Storer has joined the Pathology and Immunology Section, ORNL, leaving the post of Deputy Director, Division of Biology and Medicine, U.S. AEC.

James E. Strickland has joined the staff of the Enzymology Group, ORNL, as a postdoctoral fellow following receipt of his degree in biochemistry from Tulane University, New Orleans, Louisiana.

David L. Groves left the Biology Division, ORNL, to accept a position with the Department of Microbiology, Bowman Gray School of Medicine, Wake Forest University, Winston-Salem, North Carolina.

Amir Muhammed left the Biology Division ORNL, to return to the Radiation Genetics Unit, Lyallpur, West Pakistan.

James A. Knopp left the Biology Division ORNL, to accept a position in the Department of Biochemistry, North Carolina State University, Raleigh.

William S. Riggsby left the Biology Division, ORNL, to accept a position at the University of Tennessee at Knoxville. Dr. Riggsby will be a Consultant to the Nucleic Acid Enzymology Group, ORNL.

Robert A. Weisburg left the Biophysics Group, ORNL, to join the Laboratory of Molecular Genetics, National Institute of Child Health and Human Development, Bethesda, Maryland.

J. R. Ramirez-Martinez of the Instituto Venezolano de Investigaciones Cientificas, Caracas, Venezuela, has joined the Nucleic Acid Chemistry Group, ORNL, as a Loanee. Dr. Ramirez-Martinez received his degree from the University of California, Berkeley.

D. A. Wolfe, U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Radiobiological Laboratory, Beaufort, North Carolina, began on 1 July a 14-month research training period at the Puerto Rico Nuclear Center, Mayaguez.

Rother R. Johnson, Professor of Biological Sciences, Tennessee Agricultural and Industrial State University, Nashville, and Chester L. Jordan, Professor of Biology, Grambling College, Grambling, Louisiana joined the Pathology and Physiology Group and Mammalian Genetics Group, respectively, ORNL, as summer Research Participants.

Claire M. Berg, University of Connecticut, Storrs, joined the Biophysics Group, ORNL, as a Consultant.

David S. McDevitt, Assistant Professor of Animal Biology, University of Pennsylvania, School of Veterinary Medicine, Philadelphia, has joined the staff of the Cell Growth and Differentiation Group, ORNL, as a Consultant.

James M. Collins, a USPHS Postdoctoral Fellow in the Biochemistry of Cell Differentiation Group, ORNL, was appointed Assistant Professor of Biochemistry, Medical College of Virginia, Richmond.

Ronald W. Johnson, a graduate of the University of California, Berkeley, has joined the Biochemical Regulation Group, ORNL, as a USPHS Postdoctoral Fellow.

Robert E. Bird has joined the Biophysics Group, ORNL, as a Biology Division Postdoctoral Fellow following receipt of his degree in molecular biology from Kansas State University, Manhattan.

The News Editor regrets to report the recent death of Herman O'Dell, Professor of Biology, East Tennessee State University, Johnson City, in an automobile accident.

Oscar T. Owre has been named Robert E. Maytag Professor of Ornithology at the University of Miami, Coral Gables, Florida. Dr. Owre becomes the second Maytag chair, joining C. Richard Robbins who is Maytag Professor of Ichthyology.

Michael J. Snodgrass has joined the Immunology of Carcinogenesis Group, ORNL. He was awarded the Ph.D. in anatomy by the University of North Dakota Medical School, Grand Forks.

John M. Yuhas who received his Ph.D. in radiation biology and zoology from the University of Maryland, College Park, joined the staff of the Pathology and Immunology Section, ORNL.

Wesley D. Wicks has left the Biology Division, ORNL, to become Assistant Professor of Pharmacology at the National Jewish Hospital, Division of Research, University of Colorado Medical Center, Denver.

Preston O. Ritter, a Biology Division Postdoctoral Investigator, ORNL, has been named Research Assistant Professor of Pharmacology, Baylor University College of Medicine, Texas Medical Center, Houston.

Although Libbie Henrietta Hyman was not a member of ASB, your News Editor would feel remiss if he did not note, with regret, her death on 3 August 1969, following a long illness.

The News Editor regrets to report the death of **Ladley Husted**, Professor of Biology at the University of Virginia, Charlottesville.

Richard T. Hamlin, University of Georgia, has received a 2-year National Science Foundation grant of \$38,000 for a project entitled "Comparative Morphology of Perfect and Imperfect States of Ascomycetes."

Marvin W. Scott has been appointed chairman of the department of natural sciences at Longwood College, after having served as acting chairman since February. He succeeds Dr. Robert T. Brumfield, who resigned after eight years as department head in order to devote full time to teaching and research in which he was engaged prior to becoming chairman. A 1959 graduate of Hampden-Sydney College where he taught biology for one year, Dr. Scott came to Longwood in 1966 as assistant professor of biology.

About Institutions

The departments of Biology, Math-Physics, and Chemistry have recently moved into a new building at Alabama College, Montevallo. The building has been officially dedicated to the memory of Arthur Fort Harman, a former president of the college. The building consists of some 250,000 square feet and was built at a cost of \$1,100,000, exclusive of furnishings. An attractive feature of the building is a spacious courtyard which has been developed using, almost exclusively, native shrubs and flowers. In the courtyard is also a geode, reported to be the largest ever unearthed in this country.

Auburn University (Alabama) has discarded its old system of offering separate elementary courses in botany and zoology and has substituted an interdepartmental program in biology involving three basic laboratory courses and one lecture-only course. The new program will permit instruction in basic biological principles to all students and subsequent appropriate in depth study for non-majors and majors. W. H. Mason of the Zoology-Entomology Department has been named Coordinator.

The Department of Biology, University of Alabama, Tuscaloosa, is completing plans for a new Biological Sciences Building. The structure, scheduled for completion in 1971, will contain approximately 88,000 square feet and cost approximately \$3 million.

The initial meeting of the Triangle Mycolloquium [sic!] was convened by Royall T. Moore (Asst. Prof. of Botany, North Carolina State University at Raleigh) as a seafood buffet. The more than 30 mycologists in attendance represented the North Carolina State University at Raleigh; the University of North Carolina at Chapel Hill, Duke University (Durham) and the Research Triangle. Plans were developed for professional and social intercourse between mycologists of the Research Triangle area. Among other plans was a joint foray with mycologists from neighboring states into the Highlands area which is being organized for the Fall by Larry F. Grand (Asst. Prof. of Plant Pathology, North Carolina State University at Raleigh).

A comprehensive graduate program has been developed by the Departments of Botany, Plant Pathology, and Microbiology at the University of Georgia. Training is being offered at both the M.S. and Ph.D. degree levels, with the degree being awarded by the department in which the student enrolls. The program is designed with sufficient flexibility to permit students to pursue any special interests; students entering the program through Plant Pathology, for example, need not specialize in plant pathology, but may take a majority of their courses in related fields, such as botany and microbiology. The following courses are now being offered in the mycology program: Introductory Mycology (R. T. Hanlin), Medical Mycology (G. E. Michaels), Biology of Phycomycetes (M. S. Fuller & D. L. Porter), Biology of Ascomycetes (R. T. Hanlin), Biology of Basidiomycetes (E. W. Ross), Physiology of Fungi (W. K. Wynn), Physiological Genetics (K. E. Papa), and Microbial Genetics (H. B. Howe). Others participating in the mycological research program are E. S. Luttrell (Ascomycetes and Deuteromycetes), R. W. Roncadori (Ecology of Fungi), J. E. Giddens (Soil Mycology), W. A. Campbell and F. F. Hendrix, Jr. (Pythiaceae). Facilities are available for work in most areas of research, including taxonomy, morphology, genetics, physiology, and ecology. An additional electron microscope facility is presently under construction. The University also has strong programs of instruction in related fields, such as botany, microbiology, ecology, plant pathology, and biochemistry. Anyone desiring further information is invited to write to me or directly to the others listed above. — Richard T. Hanlin, Department of Plant Pathology, University of Georgia, Athens, Georgia 30601.

ASB BULLETIN

, 1967-69

RETURNED

QH301 THE ASB BULLETIN

.A78

*

VOL. 14-16, 1967-69

AMNH LIBRARY



100232709